

FEBRUARY 1952

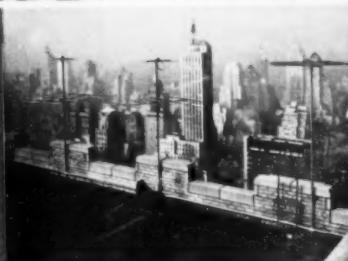
PRICE 35 CENTS

# ELECTRICAL CONSTRUCTION AND MAINTENANCE

WITH ELECTRICAL CONTRACTING



**NEW JERSEY TURNPIKE** electrical work includes roadway lighting, toll stations, service building and area facilities for new 118 mile express highway.



**TV WIRING** system pipes signals to guest and meeting rooms at world-famous Waldorf-Astoria.

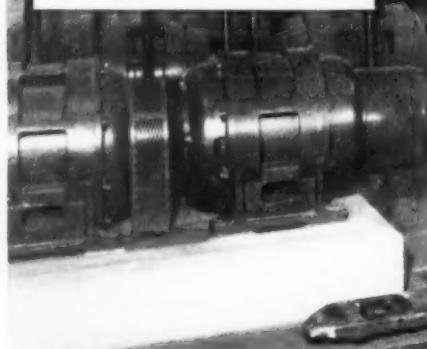


**HEATING CABLE** keeps crane runway clear of snow at Milwaukee plant.



## INDUCTROLS

KEEP PRODUCTION UP BY KEEPING VOLTAGE UP



GENERAL ELECTRIC INDUCTROLS maintain correct voltage on electrical equipment, guard against the bad effects of poor voltage. Here a new three-phase inductor is being installed in a large industrial plant.



## Is Poor Voltage Slowing Your Production?



INDUCTROLS ARE AVAILABLE for both manual and automatic operation, and both single- and three-phase circuits. Single-phase units are being prepared here for final test prior to shipment. Standard automatic regulators range in size from 3 kva, 120 volts up to 500 kva, 600 volts.

When voltage sags, motor performance and lamp brilliance suffer. Efficiency and output drop sharply. That's why it pays to keep voltage up with G-E Inductrols. These new dry-type regulators automatically maintain correct voltage on your electrical equipment—assure peak operating efficiency.

Inductrols do not require expensive fireproof vaults. All-steel cabinets, attractively styled, protect personnel by completely enclosing all live parts.

For more information on Inductrols, contact your G-E sales representative or authorized agent. Write for bulletins GEC-712, GEC-795, and GER-341, General Electric Company, Schenectady 5, New York.

### HOW POOR VOLTAGE LIMITS YOUR PLANT EFFICIENCY

UNITS	10% Undervoltage	10% Overvoltage
Incandescent Lamps	Light output cut 30%	Life reduced 70%
A.C. Motors	Overheats, ups maintenance	Power factor decreases
Resistance Heaters	Heat output cut 19%	Injurious overheating
Electronic Tubes	May destroy gas tubes	Life cut 75%

404-86

GENERAL ELECTRIC

# How does the Murray MAGNETIC BREAKER put *Security* in your Security Lighting?



## MAGNETIC ACTION GIVES MURRAY CIRCUIT BREAKERS TWO DISTINCT ADVANTAGES

1. After tripping to "off", service can be restored quickly. In most cases, the use of Murray Breakers means that service can be restored 10 to 100 times faster than circuit protecting devices which do not employ fully magnetic action.
2. Murray Breakers always carry full load regardless of temperature. Night and day, there are "hot" spots in any group of industrial buildings—overhead heaters, spot heaters, radiators, baking tunnels, furnaces, etc. Because Murray Circuit Breakers are fully magnetic, they trip only on short circuits or overloads. They always carry the full load, regardless of temperature. They never need "derating."

IF YOU WANT TO INSTALL THE BEST... specify *Murray*



**MURRAY  
MANUFACTURING  
CORPORATION**  
1250 ATLANTIC AVENUE  
BROOKLYN 16, NEW YORK

Service Intake & Meter Equipment • Magnetic Circuit Breakers • Switches  
Current Limiting Reactors • Crows'Neill Aerial Ladders

Write for descriptive folder—clip out the coupon for the complete story of Murray Breakers and Load Centers.

**MURRAY MANUFACTURING CORPORATION**

1250 Atlantic Avenue, Brooklyn 16, N.Y.

Please send me folder describing the Murray Circuit Breaker line.

Name \_\_\_\_\_

Position \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

# ONE SPARK makes the difference!



## APPLETON EXPLOSION-PROOF EQUIPMENT

Type FSQX Explosion-Proof and Dust-Tight Plug and Receptacle with interlocking safety switch.



Type EFUX Explosion-Proof X-Ray Fille Illuminator. For use in Hospital surgeries. Available in one- or two-gang models. Patent Applied for.



The Appleton Seal-Line Switch Unit is a combination switch housing and sealing unit. Completely explosion-proof without additional sealing fittings. Pat. No. 2,208,558



Safety and service features of the Appleton Type EFU Explosion-Proof Fluorescent Lighting Fixtures make them foremost in design of fluorescent lighting for hazardous locations.

Pat. No. 2,392,202



Sold Through Electrical Wholesalers

**APPLETON ELECTRIC COMPANY**  
1704 Wellington Avenue • Chicago 13, Illinois

Branch Offices: NEW YORK, 50 Church St. • DETROIT, 3049 E. Grand Blvd. • CLEVELAND, 1836 Euclid Avenue • SAN FRANCISCO, 655 Minna St. • ST. LOUIS, 227 Frisco Bldg. • LOS ANGELES, 100 N. Santa Fe Ave. • ATLANTA, 724 Piedmont, N.E. • BIRMINGHAM, 429 Brown-Murz Bldg. • MINNEAPOLIS, 305 Fifth St. S. • PITTSBURGH, 414 Bessmer Bldg. • BALTIMORE, 1017 Cherry Street. BOSTON, 10 High Street • DENVER, 1921 Blake Street • PHILADELPHIA, 1017 Cherry Street. CINCINNATI, 626 Broadway • HOUSTON, 717 M. & M. Bldg. • HAVANA, Cuba, Malecon No. 9.

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Export Representatives: International Standard Electric Corp., 67 Broad St., New York 4, N.Y.

When released in a flammable atmosphere, the tiniest electrical spark can reduce the greatest industrial plant to worthless ruin. To guard against this sudden disaster, Appleton explosion-proof conduit fittings and fixtures are expertly designed to completely seal off dangerous arcs that lurk in the wiring systems of chemical plants, oil refineries, hospital surgeries—wherever explosive or flammable vapors, dusts or gases are present.

Appleton Explosion-Proof equipment is easy to install and service. And among the hundreds of fittings and fixtures in the complete Appleton line is an explosion-proof fitting exactly suited to your needs.

No matter what your lighting or wiring requirements—explosion-proof or otherwise, specify Appleton, supplier to American builders for nearly half a century.

MALLEABLE IRON CONDUIT FITTINGS  
**APPLETON**  
OUTLET BOXES AND SWITCH BOXES  
INDUSTRIAL LIGHTING EQUIPMENT  
**PRODUCTS**  
EXPLOSION-PROOF FITTINGS • REELITES

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# Superintendent says "G-E motor



**IN CONSTANT USE,** this 15-hp, 208-220-volt G-E magnetic motor starter protects motor on a "sticker" machine.



**MOST WORK IN THIS MILL IS SPECIAL. G-E STARTERS**

## REPORTS HARD USAGE,

"About the best production 'insurance' we have," says Mr. Harry F. Rubert, Mill Superintendent of the Bretem Lumber and Manufacturing Company, "is our G-E motor starters.

"We can't afford shut-downs due to burned-out motors which have been overloaded. Not only that, but we must take every precaution against fire.

"In our search for something safe and foolproof to do the job, we decided G-E starters were our best bet.

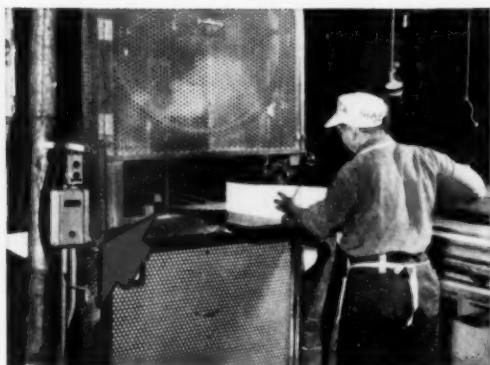


**EXCLUSIVE STRONGBOX COIL** can't be damaged by slipping screwdriver—only tool needed for maintenance.

**GENERAL**  **ELECTRIC**

28-36

# starters protect production!"

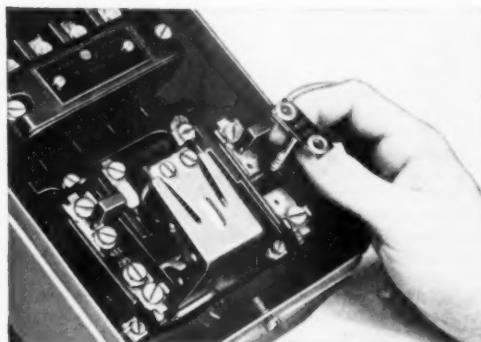


SHOWN OPERATE AND PROTECT MOTORS ON MORTISER (5 HP), RIP SAW (15 HP) AND BAND SAW (5 HP).

## EASY MAINTENANCE

We've got them all over the plant now—and believe me, they get plenty of hard use because our machines are on 'stop-and-go' all the time doing special jobs, and with various loads.

"We've used G-E starters more than three years, and I'll say they are great. They're very easy to install. Maintenance is no problem at all, and they definitely protect production by preventing costly shut-downs."



**ONLY TWO SCREWS** need be removed to install isothermic overload relay to match protection to the motor.

**LOOK FOR THIS LABEL** next time you buy a motor starter—to make certain you've got the right starter for the job you want done. Remember many different ratings are available right from stock!



**RIGHT OFF THE SHELF!** You can get many models of G-E starters right now from your G-E representative or authorized distributor—in NEMA sizes 0, 1, 2 and 3 for motors up to 50 hp. For more information on magnetic starters, write for bulletin GEA-5153; on manual starters, bulletin GEA-1522, Address Section 730-30, General Electric Co., Schenectady 5, N. Y.

**GENERAL ELECTRIC**  
**Control**  
**MAGNETIC STARTER**  
**CR 7006 D101B3**

**15 HP (MAX) 208/220 V 3 PH 60 CY**

GENERAL PURPOSE TYPE 1 CASE      SIZE 2  
FOR USE WITH SEPARATE PUSH BUTTON STATION  
REF. 151014      QTY. 1      WT. 26 LB  
SCHENECTADY, N.Y.      MADE IN U.S.A.

## ENGINEERED FOR QUALITY AND CONVENIENCE

### 3-WIRE, 2-WIRE POSITIVE GROUNDING TYPE DEVICES



No. 5349

2-Gang Combination\*: Switch, Receptacle and Pilot Light. Rugged, heavy-duty construction. Many combinations provide multiple uses and conveniences.



No. 5262

Duplex Convenience Outlet\*: Back or Side Wired. Detachable break-off fin allows ready conversion to 2 separate wired outlets. Single outlets can be controlled by wall switch.



No. 5260

Weatherproof Flush Receptacle\*: Back or Side Wired. Lift Lid, or Screw Cover type also available. For outdoor installations exposed to weather — for indoor installations exposed to humidity. Complete line available.



No. 5269 and No. 5264

Cord Connectors and Caps. Brown Bakelite with Armored Cord Grips. Fits all 3-wire receptacles.

\*Receptacles shown will also take standard 2-wire, 10-amp. plugs.

## be UP-TO-DATE

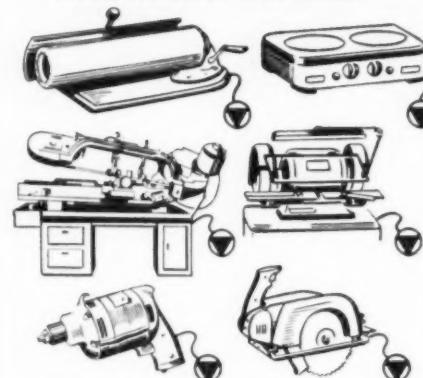
with the

## LATEST

**H & H**



### 3-WIRE, 2-WIRE GROUNDING DEVICES



**in homes**

**in shops**

**in industry**

Plan today's wiring to meet the increased demand for reliability, convenience, and protection. Do this quickly and simply; plan and build with 3-wire, 2-wire Grounding Type Devices.

Our expanded line of Grounding Type Devices is the most complete available anywhere, and has been engineered and developed to meet every modern application. For any need in planning and building, look to the latest in its field. These versatile devices offer you the key to safe living.

3-wire grounding devices have unlimited use where safety is demanded — in hospitals and doctors' offices where therapeutic and portable X-ray equipment are used; in repair shops where portable lights and tools are needed. Grounding Type Devices are also being installed in home laundries and have many other household applications where maximum protection is desired.

Three-wire Grounding Type Devices combine positive identification in grounded circuits with many other exclusive features.

For more information, write today to: 1702 Laurel Street, Hartford 6, Conn.

Branches in: BOSTON, CHICAGO, DALLAS, DENVER, DETROIT, LOS ANGELES, NEW YORK, PHILADELPHIA, SAN FRANCISCO, SYRACUSE. In Canada: ARROW-HART & HEGEMAN (CANADA) LTD., MT. DENNIS, TORONTO.

### WIRING DEVICES

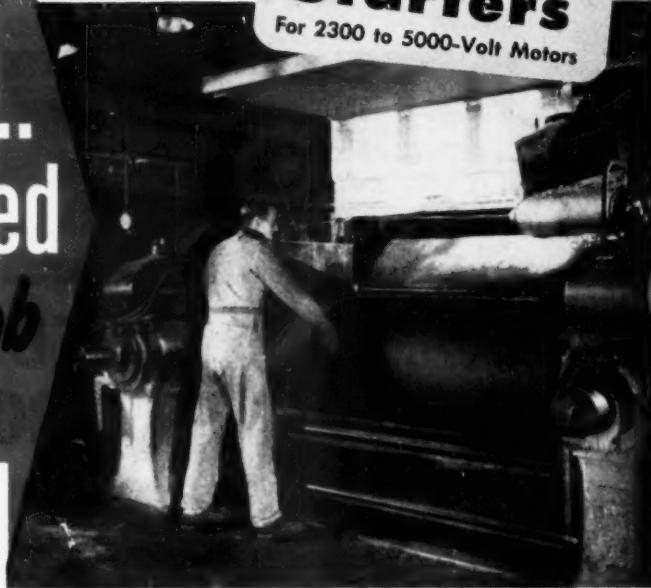


**HART & HEGEMAN DIVISION**  
**THE ARROW-HART & HEGEMAN ELECTRIC CO.**  
**HARTFORD 6, CONNECTICUT**

### ENCLOSED SWITCHES

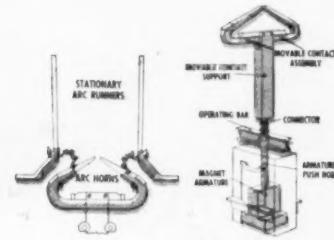
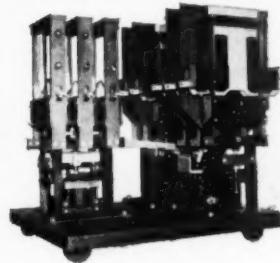
# Control... Engineered for the Job

**ALLIS-CHALMERS  
Starters**  
For 2300 to 5000-Volt Motors



WORKING THE RUBBER on this 84" mill line takes controlled power . . . the power of a 300-horsepower synchronous motor and the control of a reversing, dynamic braking starter . . . an Allis-Chalmers Type H Starter engineered specifically for the job.

A-3556



RUBBER MILL CONTROLLERS provide complete control plus protection of motor, machine and personnel. Overload relays, auxiliary switches — all needed parts are selected to meet the specific requirements of this application.

THREE AIR CONTACTORS, mechanically interlocked, assure positive reversing and dynamic braking. They are mounted on a common base . . . roll out of the cubicle . . . are completely exposed for quick, easy inspections.

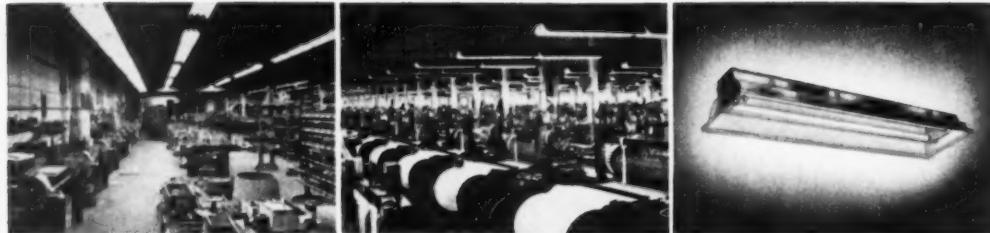
DOUBLE-BREAK CONTACTS, vertical action, dual blowout structure, and other features speed arc extinction, assure long life and low maintenance. For details about Type 256 Air-Break Contactors, get Bulletin 14B7303.

*There are Allis-Chalmers controllers for use in every industry . . . starters for squirrel-cage, wound-rotor and synchronous motors. For starters to 2500 hp at 5000 volts — check with your A-C representative, or write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 14B6410.*

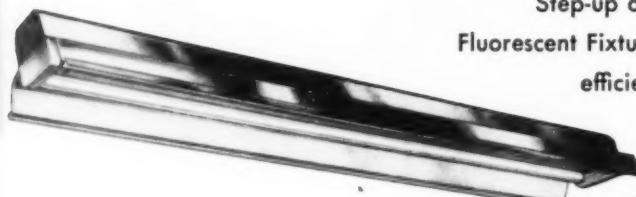
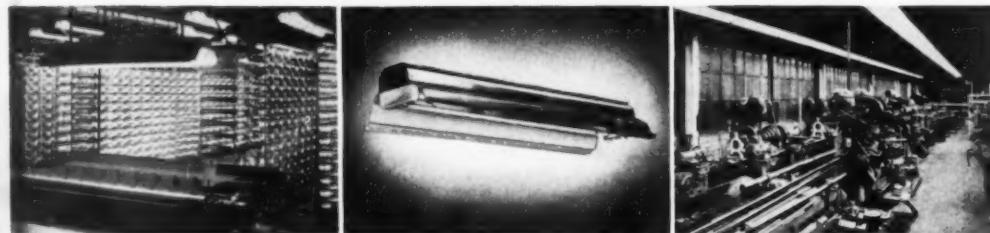
# ALLIS-CHALMERS



# Wheeler lights the way



*...to* **INCREASED  
DEFENSE PRODUCTION!**



Step-up output with specialized Wheeler Fluorescent Fixtures! Their greater lighting efficiency pays off in higher quality . . . increased production — on every job, in every type of plant condition. And Wheeler engineering means ease of installation and proven maintenance savings. Write Wheeler Reflector Co., 275 Congress St., Boston 10, Mass.

**Wheeler** **REFLECTORS**



Distributed Exclusively  
Through Electrical  
Wholesalers

MADE BY SPECIALISTS IN

"SKILLED LIGHTING"

EQUIPMENT SINCE 1881

Here's a Switch  
that thrives on  
**WORK!**



## SHUTLRAK

Type A

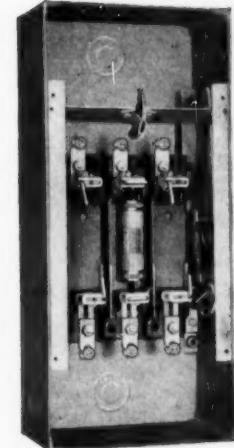
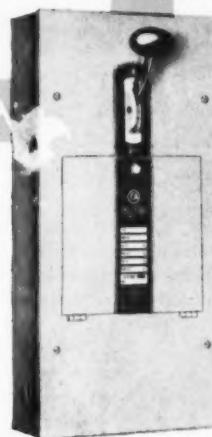
### ENCLOSED SWITCHES

⑩ Type A Shutlbrak Switches are an answer to industry's need for a high quality, long lasting, trouble-free heavy duty switch.

Featuring quick make and break operation, these safe, dependable switches have inter-locking fuse doors which automatically lock when the current is "on" and permit access when the switch is "off" (An intermediate position of operating handle provides access only by authorized persons.)

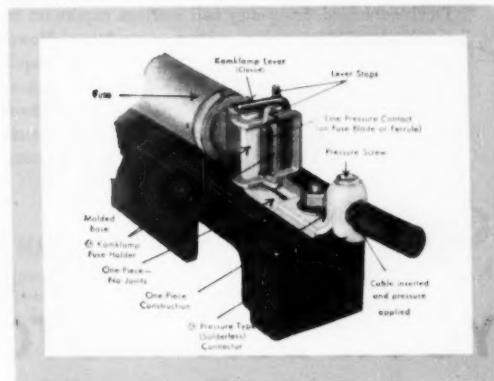
Underwriter Laboratories-approved, ⑩ Type A Shutlbrak Switches are ideal for motor control, service entrance or for any job requiring a heavy operating switch. They can be effectively used also for panelboard and switchboard assemblies.

Capacities are 30 to 1200 amps, 250 volts AC or DC and 575 volts AC in 2, 3 and 4 poles. For further information contact your nearest ⑩ representative or write for bulletin 501.



Ample wiring space at top, bottom and rear, plus a removable switch unit speed installation.

⑩ Type A Shutlbrak Switches provide split-second speed of operation with a new shuttle mechanism and heavily silvered copper contacts that roll under pressure and actually improve with use.



KAMKLAMP FUSEHOLDERS have silver plated pressure type contacts to reduce heating and eliminates the need for auxiliary means of obtaining pressure between fuse terminals and fuseholder. Solderless type pressure connectors are another feature.

# Frank Adam Electric Co.

P. O. BOX 357 ST. LOUIS 13, MISSOURI

Makers of BUSDUCT • PANELBOARDS • SWITCHBOARDS • SERVICE EQUIPMENT • SAFETY SWITCHES • LOAD CENTERS • QUIKHETER

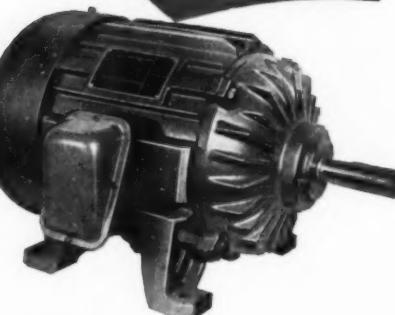


Our 61st  
Year

ALLIS-CHALMERS  
Totally-Enclosed  
Fan-Cooled  
MOTORS

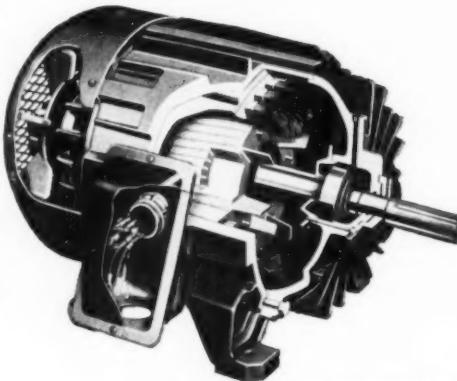
# Look Outside

Greatly increased radiating area means greater cooling efficiency. More important, cooling efficiency stays high, regardless of operating conditions. There are no enclosed external air passages to clog and cause overheating. If oily dirt sticks, just wipe or blow it off. No matter how bad operating conditions are, this motor can be easily kept clean and cool running. Electrical parts are protected against corrosive atmospheres by cast iron yokes and end housings.



# Look Inside

Double-shielded, heavy-duty ball bearings require no maintenance in ordinary service under most conditions. However, they can be lubricated without disassembly if required. Double shielding prevents over-lubrication, leading cause of bearing trouble. Rotating seals, where shaft extends through housings, keep dirt and moisture out of bearing chambers. Die cast rotor and interphase insulation are further assurance of long life and low maintenance.



## See **WHY THIS IS YOUR BEST MOTOR BUY**

HERE IS A MOTOR that is different from conventional TEFC motors; built with an entirely different cooling system that gives you big savings in lower maintenance, more continuous service and less trouble in the toughest locations. Clogging can easily be prevented in the Allis-Chalmers Type APZ TEFC motor since areas that might collect dirt are exposed and easy to clean.

**GET DETAILS NOW** — Ask your nearby Allis-Chalmers Authorized Distributor or District Office for more complete information on this high performance TEFC motor. Or write direct to Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 51B7225. **A-3378**

Texrope and Vari-Pitch are Allis-Chalmers trademarks.

**Sold . . .**  
**Applied . . .**  
**Serviced . . .**

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.



**CONTROL** — Manual, magnetic and combination starters; push button stations and components for complete control systems.



**PUMPS** — Integral motor and coupled types from  $\frac{3}{4}$  in. to 72 in. discharge and up.

# ALLIS-CHALMERS



# JOB FINISHED?

## Are You Sure?

You can be sure that the job is finished for good if you use Triangle — the quality wire, cable and conduit.

Today all electrical material must be right! Defense Plants particularly can't be allowed to slow down as a result of power failure.

Do it right the first time! Make sure the job is finished for good. Specify Triangle's Glazon Wire, Hot-Dipped Galvanized Conduit and other top quality Triangle products.

It costs no more to do the job with electrical material that is right from start to finish. Throughout both of Triangle's Plants you'll find this watchword:

"It Must Be Right"

When you specify Triangle, you can be sure it is right!



### THIS MAN SAVES YOU MONEY!

He is your Triangle Distributor. He, and all electrical distributors, lower the cost of distribution of electrical equipment to you.



*In the long run, you'll save and get it faster, from a Triangle Distributor.*

THE TRADE-MARK OF TOP QUALITY!

**▲ TRIANGLE CONDUIT & CABLE CO., INC.**

NEW BRUNSWICK, NEW JERSEY

**IT MUST BE RIGHT**

"Glazon" Building Wire • "Glazon" Non-Metallic Sheathed Cable • Armored Cable • Service Entrance, Service Drop, Varnished Cambric Braided or Leadied, Trioprene Trench, Power and Parkway Cables • Bare Wire • Rigid Conduit Hot-Dipped Galvanized • Electric Metallic Thin Wall Conduit • Flexible Steel Conduit.



# ELECTRUNITE E.M.T.



the lightweight threadless Raceway that  
completely protects conductors with steel



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REPUBLIC STEEL CORPORATION

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STEEL AND TUBES DIVISION

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224 EAST 131st ST. • CLEVELAND 8, OHIO

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ELECTRUNITE E.M.T. . . . the original Electrical Metallic Tubing

---



EASY TO CUT



EASY TO BEND



EASY TO INSTALL



EASY TO PULL THROUGH

Conductors are fully protected from fire, moisture, and mechanical injury when they're housed in ELECTRUNITE E.M.T. . . the strong-and-light steel raceway that carries the inspection of Underwriters' Laboratories and meets requirements of the National Electric Code for exposed, concealed, and concrete locations.

Ease of installation is another advantage of ELECTRUNITE E.M.T. It's easy to bend accurately . . . exclusive "Inch-Marked"® feature, plus the ELECTRUNITE Handy Bender, assures accurate bends. You can cut ELECTRUNITE E.M.T. quickly with a hacksaw. Easy-to-use compression fittings eliminate thread cutting and permit rapid, moisture-tight assembly of runs without turning whole lengths of raceway. The exclusive inside-knurl feature makes wirepulling fast and trouble-free.

Tell your ELECTRUNITE Distributor what your E.M.T. requirements are . . . he's making every effort to fill orders fairly from his share of all the ELECTRUNITE E.M.T. we have steel allocations from the government to produce.



"ELECTRUNITE" means "ELECTRICALLY UNITED"



**No. 5861**  
20 ampere  
Bakelite Enclosed Cup  
1-15 32" deep



**No. 5421**  
20 ampere  
Bakelite Enclosed Cup  
1-15 16" deep



**No. 5431**  
30 ampere  
Bakelite Enclosed Cup  
1-15 16" deep

for  
**exacting loads**



**No. 3971**  
20 ampere  
Grey Porcelain Cup  
1-1, 2" deep

**THE ANSWER IS  
BRYANT**

Bryant offers the above lines of 20 and 30 ampere flush switches designed to handle the severe loads encountered in industrial and commercial installations. But, what is the procedure in determining the proper switch to handle these severe loads? For example, how would you select the proper switch for fluorescent lamp loads?

Any electric circuit that includes an electro-magnetic device, such as a fluorescent lamp ballast, is an inductive circuit and THE NATIONAL ELECTRICAL Code requires:

"Switches controlling inductive loads shall have an ampere rating twice the ampere rating of the load, unless of a type approved as part of an assembly or for the purpose employed."

To determine the switch rating for a fluorescent lighting load, add together the primary current values marked on each ballast in the circuit and multiply the resultant figure by two.

**EXAMPLE:**

What switch should be used to control a fluorescent lamp circuit comprising 4 lighting fixtures, each fixture having four 40-watt lamps operating from two 2-lamp ballasts?

**ANSWER:**

The primary current (normal line amperes) marked on the 2-lamp ballast is 0.85 and as there are 8 ballasts, the total line current would be  $0.85 \times 8$ , or 6.80 amperes. Multiply this value by two —  $6.8 \times 2 = 13.6$  amperes. Therefore a 20 ampere rated switch should be used.



**THE BRYANT ELECTRIC COMPANY**

Bridgeport 2, Connecticut

**CHICAGO • LOS ANGELES**

# HOW BALLASTS CONTRIBUTE TO BETTER FLUORESCENT LIGHTING



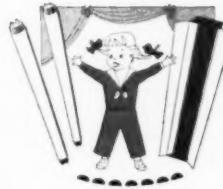
## FREE! New G-E Book Tells "Flora's" Story

Meet a young lady you should get to know—Fluorescent Ballast ("Flora" for short). Says Flora:

"If you haven't met me before, that's because they keep me backstage out of sight and let the lamps take all the bows. I don't mind because, as you'll soon see, the lamps couldn't perform at all without my help.

"My name comes from what I do. My main job is to keep fluorescent light steady . . . on an even keel . . . something like the 'ballast' in a ship. I stabilize the flow of electricity through the lamp . . ."

And so Flora tells her story in simple, easy-to-understand language. In addition to explanations of fluorescent lighting itself, the booklet contains simple explanations of various ballast circuits and the advantages and disadvantages of each. From the simplest resistance ballasting to automatic starters, up through



two-lamp ballasts, instant-starting lamps, series operation with sequence starting and, finally, trigger-start ballasts—all are carefully described.

To find out how good ballasts save you money, and why they are vital to fluorescent lighting, fill out the coupon and send it in. You'll receive your copy of "Fluorescent Ballast Tells Her Story" immediately.

General Electric Co., Sect. C 412 95,  
Schenectady 5, New York

Gentlemen: Please send me FREE copy of your booklet,  
GEA-5731, "Fluorescent Ballast Tells Her Story."

Name

Company

Street

City  State

GENERAL  ELECTRIC

# THE TWO E·M·T FITTINGS

THAT ARE EASIER TO USE—  
SAVE MONEY TOO!



Easier to use and neater in appearance, Briegel All-Steel Indenter Fittings not only make stronger connections but also make each job more profitable. Contractors the world over recognize their cost cutting qualities and the fact that they make each wiring job a better job. It is only natural that Briegel Fittings are the most widely used E.M.T. connectors and couplings.

**BRIEGEL** METHOD  
TOOL  
CO.  
GALVA, • ILLINOIS

*Distributed by*

The M. B. Austin Co., Northbrook, Ill. Clayton Mark & Co., Evanston, Ill. Clifton Conduit Co., Jersey City, N.J.  
General Electric Co., Bridgeport, Conn. The Steelduct Co., Youngstown, Ohio. Enamelled Metals, Pittsburgh, Penn.  
Wagner Malleable Products Co., Decatur, Ill. Kondz Mfg. Co., Ltd., Preston, Ont.

# Saving Money

...with high voltage  
electrical distribution?

## S&C Switchgear Units offer 30-60% savings on substations and load centers

If you're planning to revamp your electric power system to get shorter cable runs, lower line losses and better voltage regulation, don't miss this opportunity to save money on equipment costs also. S&C Switchgear Units for modern high voltage switching stations, unit substations, and load centers have high interrupting capacity, and also offer large savings over circuit breakers.

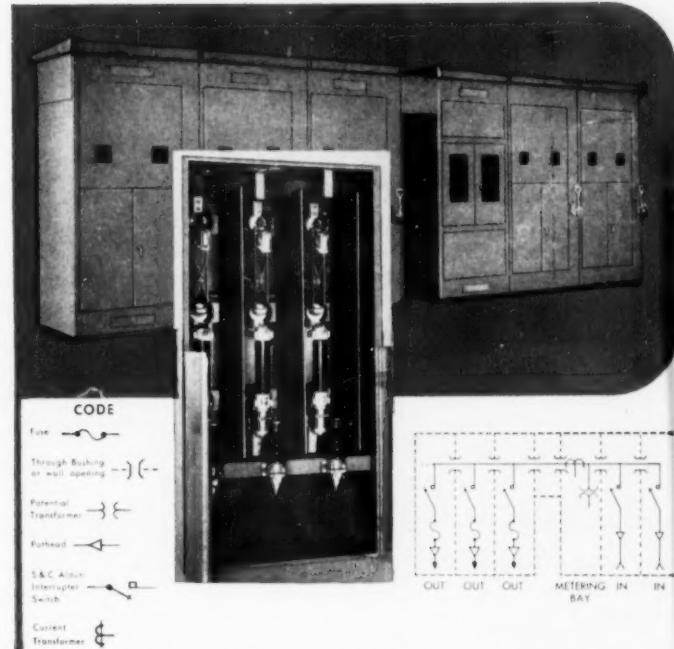
Utilizing Alduti Interrupter Switches and SM Power Fuses, S&C Switchgear Units provide the switching performance and short circuit protection described below, right. In addition they provide:

*One-package (unitized) metal-enclosed construction.*

*Ease and economy of installation* because all equipment within each unit is factory assembled and connected. Incoming and outgoing connections are readily accessible.



48-page booklet is yours for the asking.  
Consult telephone directory for S&C  
representative or write us direct.



*Minimum maintenance expense* since a blown fuse is fully restored by simple field replacement of its refill unit. Moreover, under usual conditions the switch requires no maintenance.

*Service continuity* since the reliability of S&C Power Fuses eliminates outages from surge-caused "sneakouts."

### Typical Performance Characteristics of S&C Switchgear Units

#### VOLTS

2,300 to 34,500

#### SHORT CIRCUIT PROTECTION

Expressed in 3-Phase KVA

104,000 at 2,400 volts

180,000 at 4,160 volts

448,000 at 13,800 volts

715,000 at 33,000 volts

#### AMPERES

Switches: 600, continuous and interrupting

Fuses: 400, continuous, to 15,000 volts

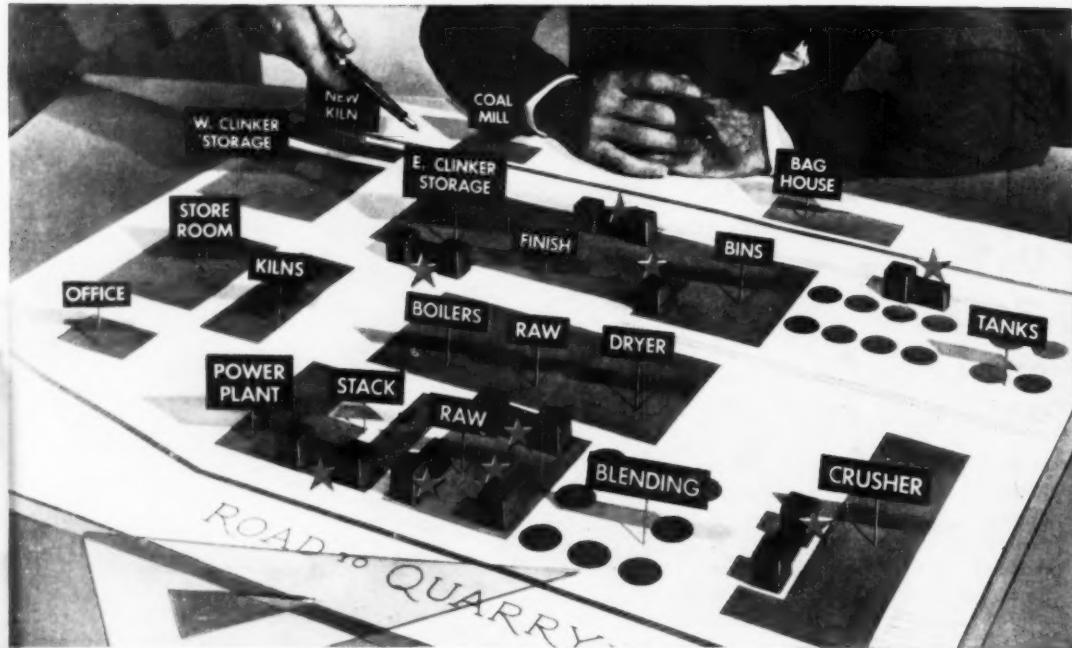
300, continuous, to 34,500 volts



4435 Ravenswood Avenue  
Chicago 40, Illinois, U. S. A.



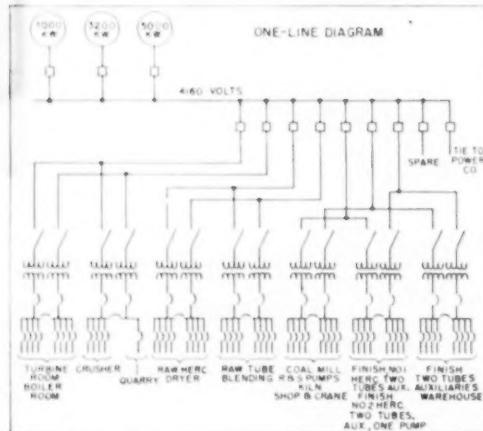
# Dewey Portland Cement Co. solves



## **Modernized System gives additional capacity**

For 30 years, waste heat from the cement kilns has enabled the Dewey Portland Cement Company to generate most of its power. Additional power for peak loads and emergency conditions is supplied by a local utility.

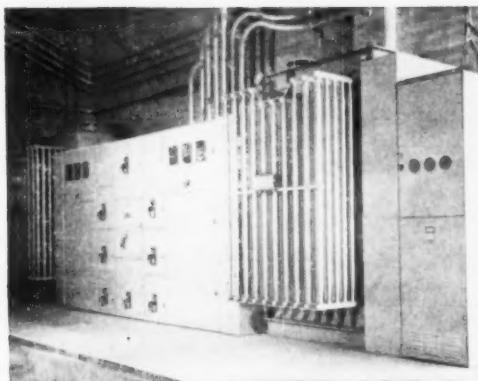
Recently, increasing demands exceeded the capacity of the Company's two turbine generators, rated 3200 kw and 3000 kw, both at 480 volts. Since inadequate interrupting capacity of the switchgear equipments prevented further use of the local utility power, a critical problem developed.



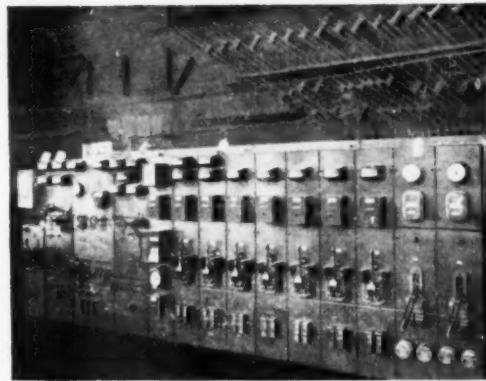
One-line diagram showing new load-center distribution system. Turbine-generators supply voltage at 4160 volts wye. High voltage is stepped down to utilization level 480Y/277-v right in the load areas. Two sources of power for each load-center unit assure the 24-hour-a-day service.



# a critical power supply problem



Double-ended load-center unit rated at 3000 kva. Seven of these are located throughout the plant. Since all units are the same size, it was possible to standardize switches, transformers, and breakers.



Old switchboard with exposed switches and conductors threatened safety of plant and personnel. Old oil circuit breakers could not provide adequate interrupting capacity if short circuit occurred.

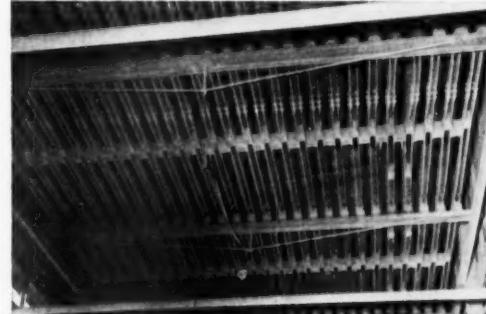
## Load-center distribution key to power expansion

Called in by the Dewey Portland Cement Co., Dewey, Okla., G-E engineers found that an additional 5000 kw required by the plant could be supplied by a modern General Electric turbine generator, utilizing available waste heat.

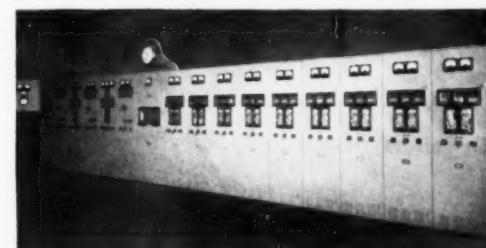
G-E specialists recommended a generated voltage of 4160 wye. Existing 480-volt generators were rewound and load-center unit substations were used to step down the voltage to utilization levels right in each of the plant load areas.

High voltage distribution eliminated tremendous quantities of heavy low-voltage conductor. Voltage drop was reduced. Flexibility was increased because later increases in power demand can be met by the simple addition of more load-center units without altering the over-all system.

Here's a typical example of the way General Electric engineers are helping industry meet today's demands for more power. For further information, contact your G-E sales representative, or write for Bulletins GEA-5600—"Power for Industry's Third and Biggest Expansion" and GEA-3592—"Load-center Unit Substations." *General Electric Co., Schenectady 5, N. Y.*



1/4" x 6" bus previously needed to distribute power at 480 volts made this roof a veritable "copper mine." With new high-voltage distribution, buses were eliminated.



New metal-clad switchgear has adequate interrupting capacity. All breakers are rated 4160 volts, 1200 amperes, 250,000 kva. Completely metal enclosed, they provide greater protection for personnel.

GENERAL  ELECTRIC

322-81

# Air-Cooled, Dry-Type Transformers

## Designed for Contractors by Contractors

By **WILLIAM R. SORGEL**

President Sorgel Electric Co.  
Milwaukee, Wis.

### Over 35 Years of Practical Experience

Originally we were electrical contractors; therefore, we know just what the contractors' problems and needs are.

We are pioneers in the development and manufacturing of air cooled dry-

type transformers, with over 35 years of continuous manufacturing experience.

Through constant research, engineering, and expert craftsmanship, we have developed that degree of perfection in our product which is so much appreciated by discriminating engineers and contractors.

### Easy Installation

Substantial wall brackets with slots for bolts or floor mounting base—an integral part of the transformers.

### Easy Connecting

Roomy connection compartment with wide choice of knock-outs, solderless terminals, and permanent connection diagram.

### All Self-Contained in a Single Unit

No separate mounting brackets or junction boxes to lose or to handle. Three-phase transformers are also in a single unit, with simple connections to make.

### Rugged Construction

All fabricated steel frames and enclosures. No castings or flimsy enclosures that would be broken or damaged during shipping or handling.

### Liberal Design

No trouble calls due to excessive heating, even at continuous full load.

### Complete Line

1/4 Kv-a. to 2000 Kv-a.  
All voltages—110 volts to 15,000 volts.  
Single phase and poly-phase.

### Also Unit Sub-Station

Complete with primary, secondary switch gear, metering, and other accessories.

### Worth Waiting for

If you want to save money and do a good job, buy SORGEL air-cooled, dry-type transformers, even though you have to wait longer than usual for delivery now during this emergency.

Sales Engineers in Principal Cities

## SORGEL ELECTRIC CO.

836 West National Ave.,  
Milwaukee 4, Wis.

Pioneers in the Development and Manufacturing of Air-Cooled Transformers



*This Bulletin tells you  
what you want to know*



## about **LOW COST TRENCHWIRE**

*for underground use*

Now is the time to be thinking of spring business. Get all the information you can NOW on the advantages of

### **CRESCENT IMPERVEX TRENCHWIRE**

Approved by Underwriters Laboratories as Type USE Underground Service Entrance Cable. Conforms to N.E. Code.

By all means, you should have complete information on this low-cost durable wire, of which tens of millions of feet have been installed over many years with an outstanding record of service.

This Bulletin gives you readily understood, technical information on the selection of the proper size of conductor, method of installation, etc. Your files are not complete without it.

**SEND FOR  
BULLETIN  
NO. 491**



**CRESCENT**  
WIRE & CABLE



**CRESCENT INSULATED WIRE & CABLE CO.**  
TRENTON, N. J.



## America needs your daily pound of scrap

IF every man, woman and child in America provided one pound of scrap each day, they would supply just about enough to produce the 105 million tons or more of new steel that the industry hopes to make in 1952.

Like yeast in breadmaking, scrap is essential to steelmaking. Scrap speeds up the process because scrap is already-refined steel. Every ton of scrap used replaces one ton of pig iron. Thus scrap also saves raw materials, because each ton of pig iron represents two tons of iron ore, one ton of coal and half a ton of limestone.

The continuing co-operation of every reader of this page is urgently requested to overcome a scrap shortage daily growing more critical. Turn in--by selling your scrap to regular scrap-gathering channels--any and all broken, worn-out or obsolete things made of iron and steel--machines, tools, pipe, boilers, structural parts and other "junk" you'll probably never use again.

Do your part in the campaign to help meet America's need for more steel. Enlist now for the duration. Remember that the scrap you furnish may help you get more steel.

### The Youngstown Sheet and Tube Company

General Offices--Youngstown 1, Ohio

Export Offices--500 Fifth Avenue, New York

MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS



The steel industry is using all its resources to produce more steel, but it needs your help and needs it now. Turn in your scrap, through your regular sources, at the earliest possible moment.

# PARKWAY CABLE



Photo courtesy of Barber-Greene Company

## For economical, direct-in-the-ground burial

YOU'LL CUT EXPENSE to the minimum by adopting Roebling Parkway Cable for distribution and general power supply circuits. This cable is buried directly in a shallow, economical trench... and assures you dependable, maintenance-free service year in, year out.

Roebling Parkway Cable is made in single and multiple conductor — solid or stranded — in a range from 600 to 5,000 volts. Furnished with metallic armor or non-metallic **ROEPRENE** sheath, depending upon the amount of physical protection required.

### C. A. A. Approved for Airport Lighting

Roebling Type A cable for 600 volts, and Type B for 3,000 and 5,000 volts, pass all C.A.A. requirements for Specification No. L-824. Both types are made in single and multiple conductor construction. Type A has RP insulation; the insulation of Type B is ozone-resistant oil-base rubber.

Large quantities of Roebling's full line of electrical wires and cables are called for in the national rearmament program. The Roebling organization and distributors will always, however, give you the best service and deliveries within their power. John A. Roebling's Sons Company, Trenton 2, New Jersey.

# ROEBLING

Atlanta, 934 Avon Ave. \* Boston, 51 Sleeper St. \* Chicago, 5525 W. Roosevelt Rd. \* Cincinnati, 3253 Frederica Ave. \* Cleveland, 701 St. Clair Ave., N.E. \* Denver, 4801 Jackson St. \* Houston, 6216 Navigation Blvd. \* Los Angeles, 216 S. Alameda St. \* New York, 19 Rector St. \* Odessa, Texas, 1920 E. 2nd St. \* Philadelphia, 230 Vine St. \* San Francisco, 1740 17th St. \* Seattle, 900 1st Ave., S. \* Tulsa, 321 N. Cheyenne St. Export Sales Office, Trenton, N.J.



**Wagner**

ELECTRIC MOTORS  
...the choice of leaders  
in industry

# Wagner Quality Motors for your product or your plant

When you select a motor from Wagner's complete line, you get a motor that is completely dependable in its specific application. You can choose from a wide variety of types and sizes. Here are a few of the motors in the Wagner line. At right is TYPE RP—open type polyphase squirrel-cage motor. It is drip-proof and suitable for all general purpose applications. 1/6 to 400 hp.



## SINGLE-PHASE



TYPE RB—Split phase induction. For easy starting applications with high starting current. 1/20 to 1/2 hp.



TYPE RX—Capacitor Start Induction. For general purpose applications requiring high starting torque—normal starting current. 1/6 to 3 hp.



TYPE RG—Repulsion Induction. For high starting torque applications involving a very long starting period. 1/2 to 5 hp.



TYPE RA—Repulsion Start Induction. For general purpose applications with high starting torque—low starting current. 1/2 to 15 hp.

## POLYPHASE MOTORS



TYPE XP—Splashproof. Protected against splashing or dripping liquids. 1/4 to 200 hp.



TYPE TP—Totally enclosed, non-ventilated. Fully protected. 1/4 to 15 hp.



TYPE CP—Totally Enclosed Fan-Cooled. Protected against dirt, chips, abrasives or fumes. Steel frame. 1 to 250 hp. Also in explosion proof type HP.



TYPE EP—Corrosion resistant. Totally Enclosed Fan-Cooled. Cast iron frame. 2 to 250 hp. Also available in explosion proof type JP.



TYPE RS-1—Wound Rotor. Constant or adjustable varying speed. 1 to 250 hp. TYPE RS-2 for intermittent service. 2 to 200 hp.



GEAR MOTORS—Single phase or Polyphase. Open or enclosed types. 1/20 to 50 hp.



DIRECT CURRENT MOTORS—Companion line to Wagner A.C. Motors. 1/6 to 3 hp.

In addition to a complete line of motors, Wagner also furnishes Increment Type Motor and Starter Combinations, Jet Pump Motors and a complete line of Transformers. Dry-type, Distribution and Power. Wagner engineers welcome an opportunity to serve you. Consult the nearest of 32 Branch offices, or write direct.

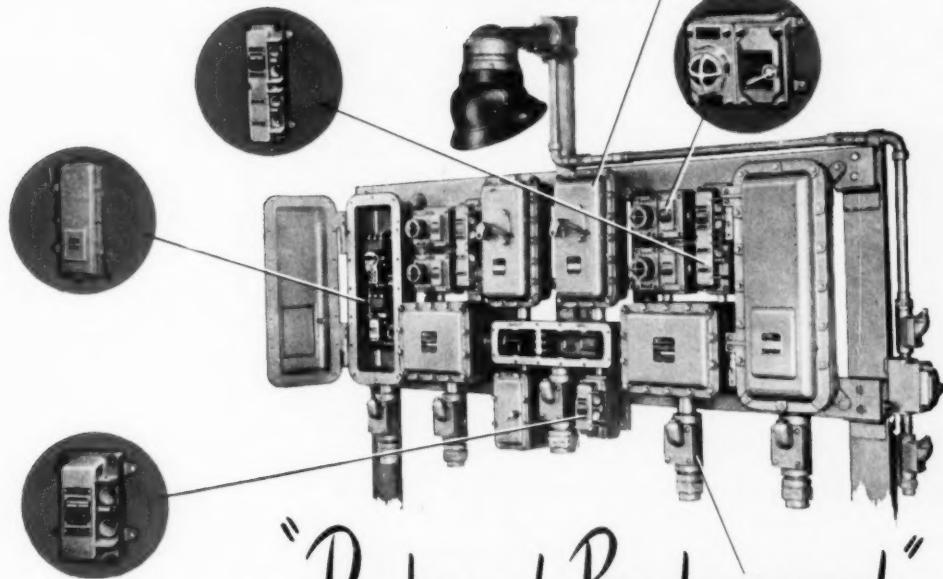
**Wagner**  
Electric Corporation  
EST. 1891

WAGNER ELECTRIC CORPORATION  
6413 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES  
AUTOMOTIVE BRAKE SYSTEMS • AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

# *Explosion-proof* **CUSTOM BUILT R&S PANELS**



**HAVE A**

"Packaged Background"

Russell & Stoll custom built panels utilize standard R & S equipment as "packaged" components wherever possible. Note how well this better, faster, more economical construction method has been employed on the oil pipe line plant panel illustrated.

R & S thereby by-passes all the uncertainties, delays and expense of "special design" equipment. R & S panels are factory built, sealed and tested, offering simplified construction and pre-engineered performance.

No panel can be better than any of its component parts. And every R & S panel has benefits that stem from selection and use of precision-made units from the complete R & S explosion-proof line. R & S circuit breakers, switches, pilot lights, push button stations and other control devices have standout advantages such as removable front covers, abundant wiring space and conduit openings — in addition to individual features that meet all standards, *plus*.

WRITE FOR CATALOG NO. H47-4

RUSSELL & STOLL COMPANY, INC. • 125 BARCLAY STREET, NEW YORK 7, N.Y.

1902-1952

DS

# RUSSELL & STOLL

PRECISION-BUILT ELECTRICAL EQUIPMENT—SINCE 1902

# WHEN THINKING OF ELECTRICAL PROTECTION KEEP IN MIND THAT

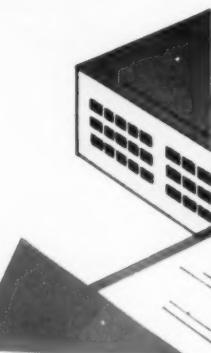
with rare exceptions on Commercial and Industrial installations

**Ordinary Fuses and Breakers  
DO NOT PROTECT EXCEPT  
AGAINST SHORT CIRCUITS**

## Fusetron dual-element Fuses—

- 1 Protect against short-circuits.
- 2 Protect against needless blows caused by harmless overloads.
- 3 Protect against needless blows caused by excessive heating — lesser resistance results in much cooler operation.
- 4 Provide thermal protection — for panels and switches against damage from heating due to poor contact.
- 5 Protect motors against burnout from overloading.
- 6 Protect motors against burnout due to single phasing.
- 7 Give DOUBLE burnout protection to large motors — without extra cost.
- 8 Make protection of small motors simple and inexpensive.
- 9 Protect against waste of space and money — permit use of proper size switches and panels.
- 10 Protect coils, transformers and solenoids against burnout.

**COUNT 'EM**



### DON'T RISK LOSSES

One **needless** shutdown . . .

One **lost** motor . . .

One **destroyed** switch or panel

One **burned out** solenoid . . .

May cost you far more than replacing every ordinary fuse with a Fusetron dual-element Fuse.

**Mall the coupon now** for complete information about the All-Purpose Protection of FUSETRON Dual-Element FUSES.



\* Fusetron Fuses have high interrupting capacity shown by tests of the Electrical Testing Laboratories of New York City in December 1947.

Bussmann Mfg. Co., University at Jefferson  
St. Louis 7, Mo. (Division McGraw Electric Co.)

Please send me complete facts about FUSETRON  
dual-element Fuses.

Name \_\_\_\_\_

Title \_\_\_\_\_

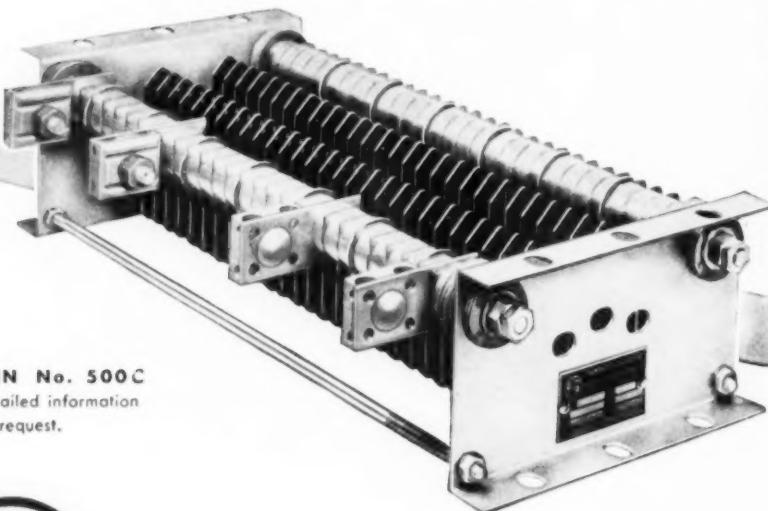
Company \_\_\_\_\_

Address \_\_\_\_\_

City & Zone \_\_\_\_\_ State \_\_\_\_\_ ECM-2-52

# Dependable RESISTOR Performance

P-G Steel Grid Resistors are basically dependable because of steel and mica—non-breakable raw materials. With P-G unique grid design, plus sound resistance values and conservative capacities, resistor troubles are minimized. Specify these dependable resistors for your next application.



#### BULLETIN No. 500C

Gives detailed information  
Copy on request.



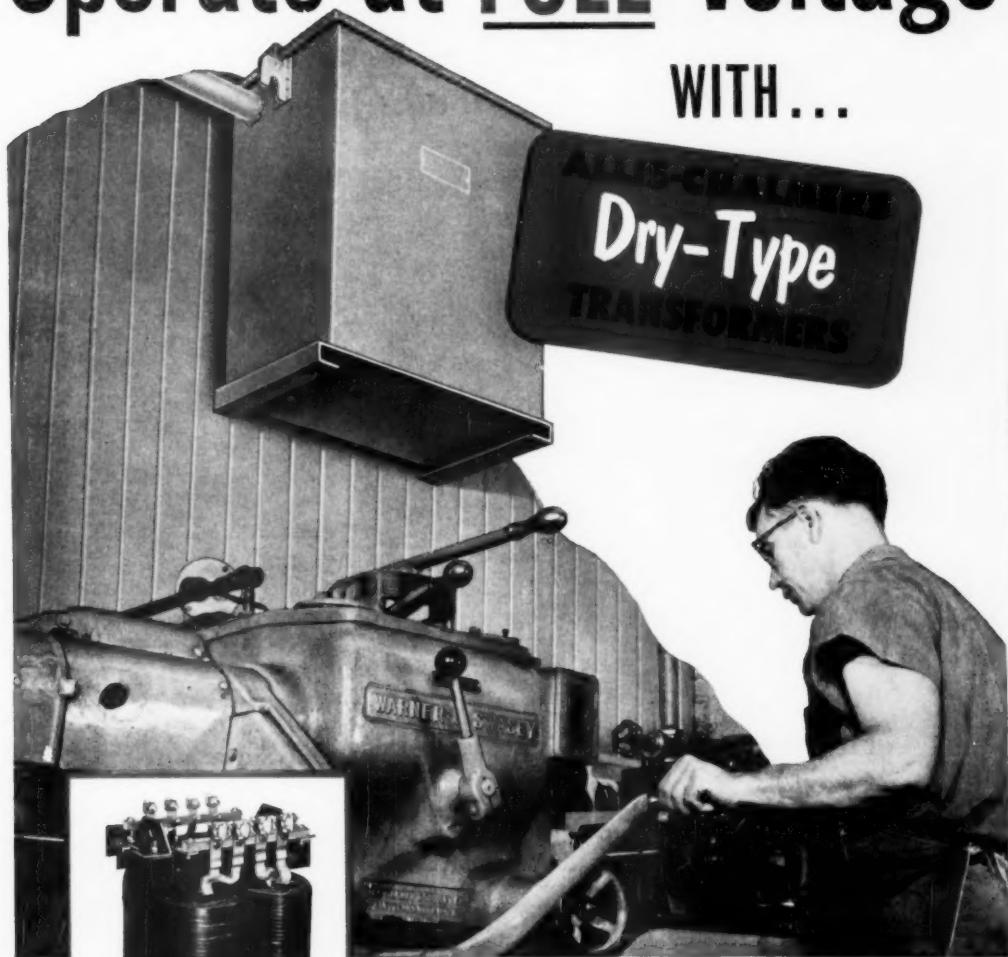
*The Nonbreakable Steel Grid Resistor*

**THE POST-GLOVER ELECTRIC COMPANY**

ESTABLISHED 1892  
221 WEST THIRD STREET, CINCINNATI 2, OHIO

# Operate at FULL Voltage

WITH...



Time-saving solderless connectors are standard on units 15 through 50 kva, single phase, and 37½ through 100 kva, three phase.

MAXIMUM EFFICIENCY is obtained when motors and other equipment are operated at rated voltage. Allis-Chalmers dry-type transformers installed close to the load provide full voltage for efficient motor operation, bright, flicker-free lights, and full heating of thermal equipment. Long expensive runs of secondary copper are avoided and distribution losses are minimized.

Transformers are easy to mount. Install them on walls, platforms, posts or directly on machines. No expensive fire-proof vaults are needed. Available in a wide range of sizes.

Write Allis-Chalmers, Milwaukee 1, Wis., for bulletin 61B6382A.

A-3609

## ALLIS-CHALMERS



# Factory Lighting Comes of Age

## with this NEW Litecontrol Industrial Fixture



Available for slimline lamps in 4' and 8' lengths (series 2400), and for bi-pin lamps in 4' lengths (series 2300).

HERE IT IS — the new LITECONTROL Industrial Unit that provides "white coat lighting for shop coat areas."

**Minimum waste light... maximum lighting efficiency** — This unit, employing general diffuse design, provides vent areas at the root of the hood. Light is not "trapped" and thereby wasted as in older hood types, but instead is reflected through the vent to the ceiling and thence again to the working area where it is needed.

**Sturdy construction... durably finished** — The all-metal heavy gauge bonderized steel construction provides structural rigidity. And the LITECONTROL double-coated white finish is guaranteed not to chip, fade or discolor.

**Maintenance minimized... mounting simplified** — There's no maintenance worry with this LITECONTROL advance design. Lamps and starters can be easily replaced without disturbing baffles. Smooth curved sides can be wiped clean without cloth-snagging... no inaccessible dust corners. Diffuse design also helps keep interior of fixture clean through convection currents and overhead "escape hatch" for dust.

Mounting, too, is easy. Suspension mounting is recommended for peak

performance, but provision is made for other methods where preferred or necessary.

**Consult your lighting specialist... and write for free booklet today** — A consultation with your lighting advisor... or with your nearby LITECONTROL Representative will save you time, money and trouble. If you are planning on new lighting for your factory, call on him today... and write today for your free copy of our new booklet: "Industrial Fluorescent Lighting by LITECONTROL."

**LITECONTROL Fixtures**  
KEEP UPKEEP DOWN  
LITECONTROL CORPORATION, 36 Pleasant Street, Watertown 72, Massachusetts

DESIGNERS, ENGINEERS AND MANUFACTURERS OF FLUORESCENT LIGHTING EQUIPMENT DISTRIBUTED ONLY THROUGH ACCREDITED WHOLESALERS



# PICK 'EM OUT PLUG 'EM IN

1

Select Multi-Breaker units required by job.

2

Assemble units to panel by "plugging in".

## Make up the Cutler-Hammer Type NMO MULTI-BREAKER "Plug-In"

# BREAKERPANELS

TRADE MARK

*on the job - for the job*

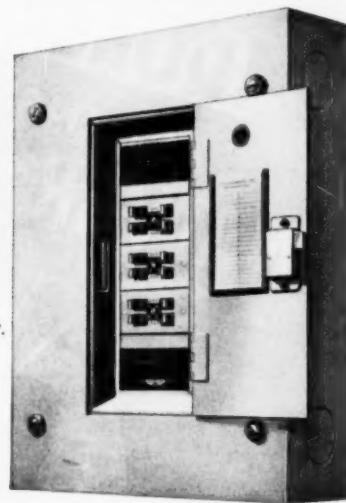
No matter what the job calls for when you get there, you are all set when you have a Cutler-Hammer Type NMO Breakerpanel. No matter what circuit load changes may be required if you are called back later on, you are *ready* if you have installed a Cutler-Hammer Type NMO Breakerpanel. For you make up these distribution centers with the Multi-Breaker Plug-Ins right on the job for the job. No guesswork. No mistakes. The Multi-Breaker units you select to serve your circuits just plug into place. Where you want a 15 ampere breaker, you plug in a unit containing the exact number of 15 ampere single pole breakers required up to four. These units are available in 29 different circuit combinations making it possible to obtain the exact quantity and rating of branch circuits with a minimum of effort.

Cutler-Hammer Type NMO "Plug-In" Breakerpanels are now offered in sizes with from 8 to 42 single pole branch circuits in increments of 2. They are available in 120/240 Volts a.c., with 50, 100 and 200 ampere mains (lugs or circuit breaker) with 15, 20 and 30 ampere single and double-pole branch cir-

cuits; also, 40 and 50 ampere double-pole branch circuits. Multi-Breaker units are of the thermal-magnetic type that provide a lag on harmless overloads but instant trip on shorts.

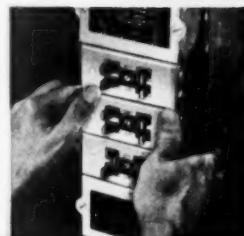
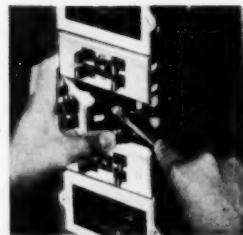
Wiring these Type NMO Multi-Breaker units is also a cinch. You can wire them right in your hands before you plug them in... or you can simply swing them out for wiring as shown, using one of the positive-pressure contact jaws turning on the silvered bus bar as a hinge. And despite the small size of these Breakerpanels that better utilize wall and column space, you get much more gutter space (5½" in the 15" box) with more circuits. The narrow column type actually has *double* the number of circuits previously available in cabinets of similar height.

Beyond any doubt, this is the finest protection, the easiest to install, the most flexible, the most compact, and the most modern it is possible to obtain where a large number of branch circuits must be served, as in commercial and industrial buildings, hotels, schools, hospitals, large homes, etc. CUTLER-HAMMER, Inc., 1306 St. Paul Avenue, Milwaukee 1, Wisconsin.



3

Wire them.

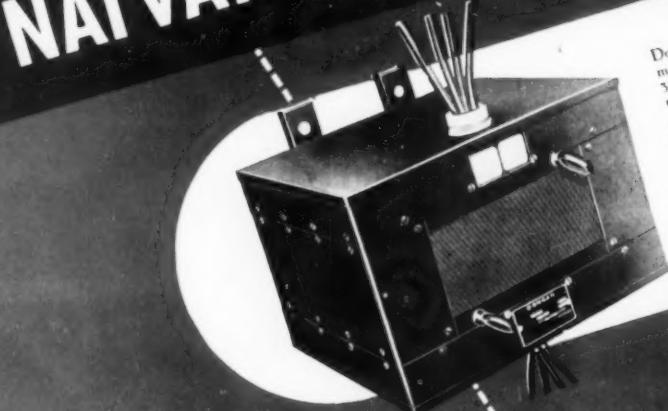


4

Plug them in place again.



# DONGAN Transformers ARE INSULATED WITH NATVAR Varnished Cambric



Dongan power circuit transformers are made in capacities from 050 KVA to 37.5 KVA, single phase and from 3 KVA to 50 KVA, three phase. Single phase transformers have two primaries and two secondaries which can be connected either in series or in parallel. Dongan 253-1000, illustrated, is rated 10 KVA, primary, 460/250 volts, secondary, 230/115 volts; 50/60 cycles. Natvar varnished cambric is used as insulation between the four windings and also as an outside wrap for the entire coil assembly.



## Natvar Products

- Varnished cambric—straight cut and bias
- Varnished cable tape
- Varnished canvas
- Varnished duck
- Varnished silk
- Varnished special rayon
- Varnished Fiberglas cloth
- Silicone coated Fiberglas
- Varnished papers
- Star insulation
- Varnished tubing and sleeving
- Varnished identification markers
- Lacquered tubing and sleeving
- Extruded plastic tubing and tape
- Extruded plastic identification markers

Ask for Catalog No. 22

Dongan Electric Manufacturing Co., Detroit, has manufactured "The Dongan Line Since 1909." This line of dry type transformers includes air cooled power circuit transformers, transformers for gas and oil burner ignition, for neon sign and cold cathode lighting, for electronics and communications equipment, and for machine tools.

Natvar Varnished Cambric has been used as insulation for many years because of its consistently good electrical and mechanical properties.

All Natvar flexible insulations are consistently uniform no matter when or where purchased. They are available either from your own wholesaler's stock or directly from us.

THE NATIONAL VARNISHED PRODUCTS CORPORATION

Telephone  
Belleville 7-6999

Cable Address  
NATVAR, Belleville, N. J.

205 RANDOLPH AVENUE • WOODBRIDGE, NEW JERSEY



PETER  
MESSE

**YOU CAN DO A LOT  
WITH A LITTLE  
JENKINS**



Jenkins Bros. also make Diamond Seal Friction and Rubber Tapes which meet both ASTM and Federal specifications.

"It's just what the doctor ordered," say linemen and electricians. Gold Seal Tape tears evenly, quickly . . . will not dry out, peel, or ravel (production is laboratory-controlled to assure lasting "tack" in the friction compound). *Go further, too*—there's no waste with Gold Seal. Produces not only better-taped joints, but more joints per roll. Buy it in handy cartons of 10 or by the roll. Each roll is cellophane-wrapped — *factory-fresh*. Jenkins Bros. (Rubber Div.), 100 Park Ave., New York 17.

**Gold Seal Tape**  
FRICTION and RUBBER TAPES

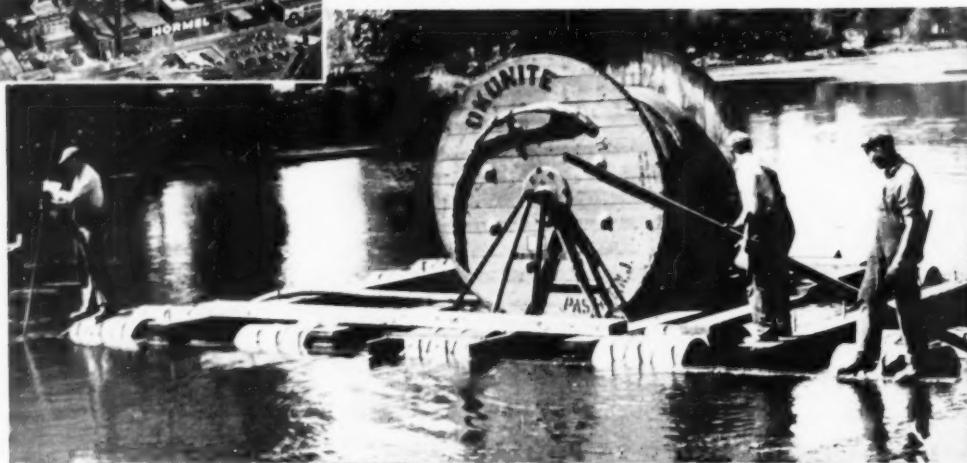


In either 10-roll cartons or single rolls. Every roll cellophane-wrapped.

**MADE BY JENKINS BROS. . . MAKERS OF FAMOUS JENKINS VALVES**

# HORMEL

# Makes Sure



## ...with OKOLITE cables

### Costly perishables depend on uninterrupted power transmission

At Hormel's plant in Austin, Minn.—home of famous "SPAM"—thousands of dollars worth of meat are constantly being processed. Any breakdown or stoppage of electrical service would cause a tremendous loss.

When Hormel enlarged its electrical requirements, engineers installed two 13.8 kv Okolite submarine cables to convey power from the municipal plant across the Red Cedar River to the Hormel switchboard. Cables were laid from a raft specially constructed to clear obstructions in the river.

Here are some of the reasons why Okolite-insulated cable was chosen for this important installation:

Long-lived, electrically-strong Okolite insulation resists corona cutting, heat and moisture, requires no lead sheath, even when totally submerged. Okolite has an outstanding record in submarine cable service for voltages up to 35,000 volts.

All Okolite-insulated cables, whatever their end use, are subjected to super-voltage a-c and d-c tests considerably in excess of industry specifications.

On any installation where uninterrupted service is imperative, Okonite is your best cable buy—to be sure. The Okonite Company, Passaic, N. J.



# OKONITE



insulated wires and cables

THE BEST CABLE IS YOUR BEST POLICY

9409

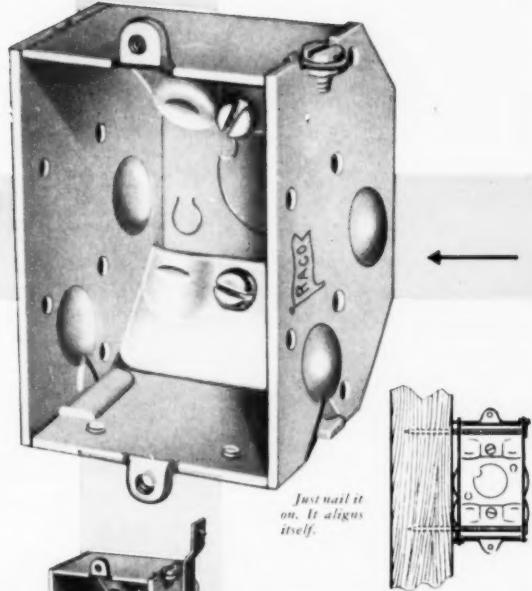
THE **BUMPS** DO IT

... when you nail these  
boxes directly on studding,  
they align themselves

These Raco "economy" switch boxes fasten firmly to studding in new work simply by nailing through the holes provided. It's a fast mount. And you get perfect alignment because the leveling "bumps" have the added height and engineered spacing to line up the box with the studding in exact position. No danger of compressing the sides. Ears have been eliminated for economy.

And—an added Raco feature—the "straight-thru" nail holes are large enough for 16D nails.

This economy style is available in all types of switch boxes . . . all Raco quality, of course.

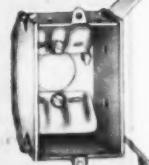


#### BRACKET TYPE BOXES



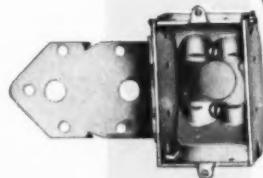
#### FLAT BRACKET

—this is a sturdy bracket which allows the box to be adjusted to all wall thicknesses.



#### SIDE MOUNT

—a new bracket on a nationally popular box, especially formed for door frame clearance. The bracket is gauged for standard wall thickness. "Break-off" gauges allow adjustment to all wall thicknesses.



#### FACE MOUNT

—a newly redesigned bracket, with rounded safety-style corners. Bracket is also equipped with nailing prongs.

# RACO

THE RACO LINE

ALL-STEEL EQUIPMENT Inc.—800 Kensington Ave., Aurora, Illinois

There's a RACO Bracket Mount Box for Every Job

YOU CAN ALWAYS RELY ON RACO



**BENJAMIN**

# "Magna-Flo"

so complete, you can always obtain

## Task Matched Lighting Installations

To get all the extra lighting efficiency of the three new T12 Slimline Lamps, you need units that are **MATCHED TO THE TASK**—not substitute sizes and types, or a compromise on a "second choice." You get **MATCHED TO THE TASK** Units when you specify Benjamin "Magna-Flo" Fluorescent Lighting Units!

Like all Benjamin Lighting Systems, the "Magna-Flo" Line is complete! It is *so complete* because, basically, just three channel sizes and four types of reflectors form the backbone of an almost unlimited system to match any industrial lighting task!

High bays or low ceilings, moist or dirty locations, assembly lines or drafting tables, continuous-line lighting or individual units, lighting for inspection or mass production—whatever the seeing conditions and requirements of the task, you can get a "Magna-Flo" System that is **MATCHED TO THE TASK** because it is *so complete*! Further, in "Magna-Flo" Systems you get the most important features for sustained lighting performance and simplified maintenance, including exclusive Benjamin "Springlox" Lampholders for "easy-in, easy-out" lamp maintenance.

Write for Bulletin AD-5705 for complete specification data on Benjamin "Magna-Flo." Benjamin Electric Mfg. Co., Des Plaines, Ill.

Dept. H

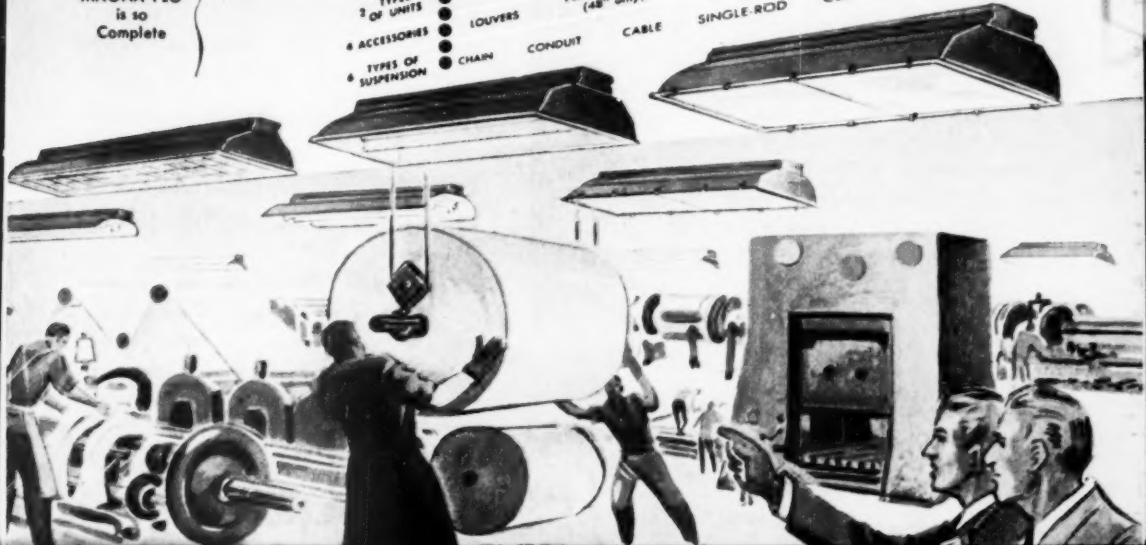
Here's Why  
"MAGNA-FLO"  
is so  
Complete

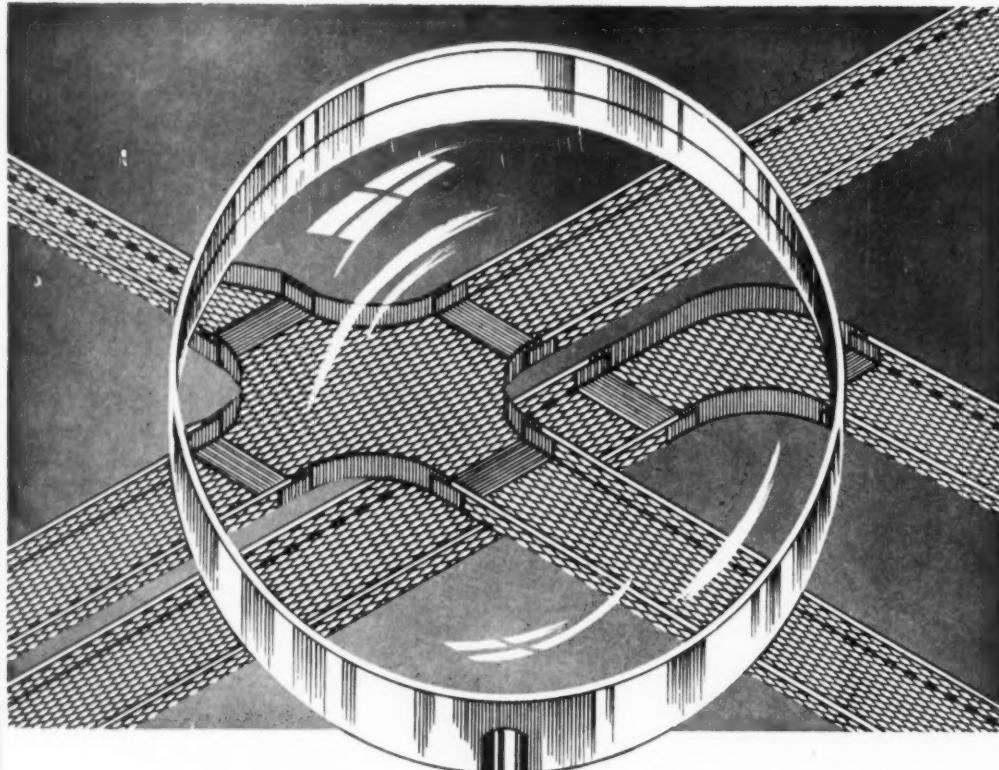
HUNDREDS OF COMBINATIONS TO EXACTLY MATCH THE LIGHTING TASK

from these basic CHANNELS and REFLECTORS with T12 Slimline Lamps

- 3 LAMP HOLDERS
- 2 TYPES OF UNITS
- 4 ACCESSORIES
- 6 TYPES OF SUSPENSION

- OPEN END
- 48"
- 72"
- 96"
- CLOSED-END
- OPEN-END W/APERTURES
- 3-LAMP "SPRINGLOX"
- 2-LAMP "SPRINGLOX"
- INDIVIDUAL
- LOUVERS
- CABLE
- CONDUIT
- PLASTIC COVERS (48" only)
- GLASS COVERS (48" only)
- SINGLE-ROD
- CEILING
- TWIN-ROD
- CONTINUOUS LINES
- SHIELDS
- 96" CLOSED END W/APERTURES





## MAN-HOURS CUT ...and Money Saved... With the New System of **COPE CABLE TROUGH**

To save man-hours in today's Emergency is vitally important. That's why utilities, industrial plants and government agencies have installed the new simplified, versatile and time-saving Cope Cable Trough in preference to using old-fashioned methods of carrying control cables and instrument tubing.

During all stages—from the moment the Design Engineer specifies the use of Cope Cable Trough—during the time it is installed—and at the time the cable is being laid—man-hour after man-hour is saved by using Cope Cable Trough. The Design



Engineer can order a complete installation as easily as a pipe system. The men in the field find it simple to install—where necessary, trough can be cut and fitted with a hack-saw—the only installation tools required being a pair of pliers and a wrench. Cable can be easily installed in the trough. And to meet unusual conditions, the Cope Engineering Staff will design special fittings for customers.

Yes! Cope Cable Trough is doing its part in saving—saving labor, saving material and saving costs.

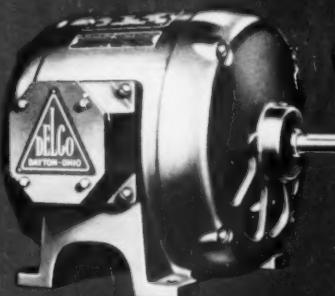
Write today for your copy of the new bulletin on Cope Cable Trough.

**T. J. COPE, INC., 711 SOUTH 50th ST.  
PHILADELPHIA 43, PENNSYLVANIA**

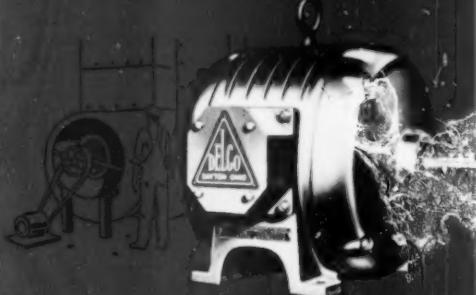


*You know Cope  
by these Products . . .*

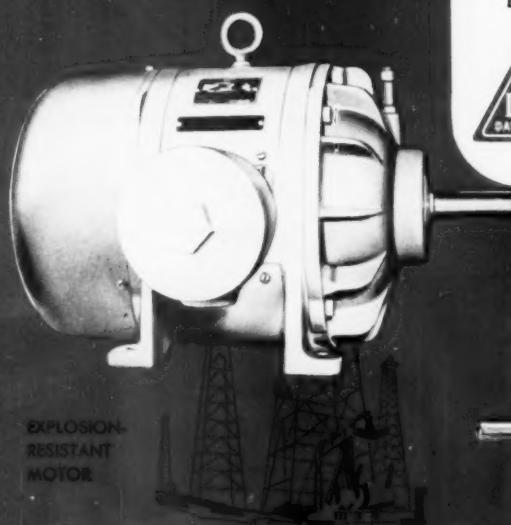




OPEN BALL-BEARING MOTOR



TOTALLY ENCLOSED, NON FAN COOLED MOTOR



EXPLOSION-  
RESISTANT  
MOTOR

SALES OFFICES: ATLANTA • CINCINNATI • CLEVELAND • DALLAS  
DETROIT • KANSAS CITY • PHILADELPHIA • SAN FRANCISCO • ST. LOUIS

Whatever the job  
you're right with a  
**DELCO!**

Whether . . . need totally enclosed or open-end motor . . . fan cooled or explosion-resistant motors . . . you're certain to get the right motors on the job when you choose Delco.

Each and every Delco motor is designed and built for the job it has to do. It's *made* of the finest materials, and *engineered* to stand up longer under the roughest conditions.

So check up on Delco motors, now. You'll find Delco has the motors you need, and that Delco always meets its commitments. For full details, write to Delco Products, Dayton, Ohio, or call the nearest sales office listed below.

**DELCO FEATURES MAKE DELCO FINEST**



**DELCO<sup>®</sup> PRODUCTS**

Division of General Motors Corporation  
Dayton, Ohio



TOTALLY ENCLOSED, FAN COOLED MOTOR

# Now, get immediate local delivery on BullDog Panelboards up to 42 circuits

**At long last, panelboards have been simplified,  
standardized! Your BullDog Distributor can fill your order  
on the spot from just 5 basic devices.**

**BullDog** has now standardized panelboards. Only 5 catalog numbers replace hundreds . . . fill any lighting panel requirement up to 42 circuits. And they are available right now for immediate, over-the-counter delivery at your local BullDog Distributor's.

There's no more need to special-order costly, custom-built panels, or wait long weeks for delivery. No more delays when a job's in a

hurry. You can get a top-quality BullDog Pushmatic Electri-Center Panelboard to meet your exact circuit and rating requirements in a matter of minutes.

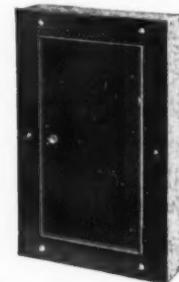
See your BullDog Distributor next time you need Panelboards. You'll discover that BullDog Panelboards cost less than most other makes, and are more flexible, easier to install. Check the features listed on these pages.



**1 INTERIOR:** Your local BullDog Distributor now stocks 5 flexible interiors that will fill any panelboard need up to 42 circuits.



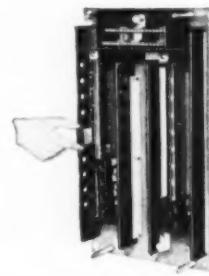
**2 BOX:** A Code Gauge steel box with ample knockouts is supplied to fit the single-phase, or 3-phase 4-wire interior you buy.



**3 FRONT:** Attractive gray fronts also supplied over the counter. Include door and trim. Either flush or surface type available.



**4 PUSHMATIC:** You select fully interchangeable Pushmatic circuit breakers according to number desired and ratings needed.



**5 FLEXIBLE:** Pushmatics slip in easily. Filler plates may be used in spaces where you might want to add extra circuits later.



**6 COMPLETE:** And here is your complete BullDog Panelboard! Delivered and assembled in minutes right to your exact specifications.



## BULLDOG Pushmatic Electri-Center Panelboards

- For plants, commercial buildings, institutions.
- Underwriters'-approved up to 42 circuits.
- Meets Federal specifications WP 131a Class A
- Push-button switching and automatic circuit protection. No reset position.
- Individual Pushmatic units (Thermal Magnetic) rated 15, 20, 30, 40, and 50 Amps.; quick-mounting, fully interchangeable.
- Code Gauge steel fronts, flush or surface type.
- Code Gauge steel boxes with ample knockouts in removable ends.
- 4"-wide gutters for easy wiring.
- Provisions for Main Lugs at top or bottom.
- Flexible from every standpoint.

**JUST 5 DEVICES  
MAKE UP 2 COMPLETE  
PANELBOARD LINES**

**Single-Phase, 3-wire, Solid Neutral**  
(P3B-304-28L) 28 circuits Max. Mains 200 amp.  
(P3B-304-40L) 40 circuits Max. Mains 200 amp.

**3-Phase, 4-wire, Solid Neutral**  
(P3B-406-21L) 21 circuits Max. Mains 100 amp.  
(P3B-406-30L) 30 circuits Max. Mains 100 amp.  
(P3B-406-42L) 42 circuits Max. Mains 200 amp.

WRITE FOR DESCRIPTIVE BULLETIN 513



# BULLDOG

**BULLDOG ELECTRIC PRODUCTS COMPANY**

DETROIT 32, MICHIGAN • FIELD OFFICES IN ALL PRINCIPAL CITIES

IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO

PIONEERS IN FLEXIBLE ELECTRICAL DISTRIBUTION SYSTEMS

1902-1952 . . . SERVING INDUSTRY FOR 50 YEARS WITH FINER ELECTRICAL PRODUCTS

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . FEBRUARY, 1952

# Easy to install...



## That's why TRANSITE DUCTS save time, labor and money

THESE "ON THE JOB" photographs show why savings begin right at the start of the installation when you use Transite\* Ducts.

The light weight of Transite Conduit and Korduct permits hauling a substantial footage of duct per truck. Handling is fast, too, because the asbestos-cement composition of Transite Ducts makes them strong and tough. The longer length of each duct . . . 10 feet . . . reduces the number of joints in the completed line. And joints are quickly made with the Transite Tapered Coupling that is engineered to stay tight in service.

For the full story of how Transite Ducts can reduce your cableway costs, write Johns-Manville, Box 290, New York 16, New York.

### 4 OTHER REASONS WHY TRANSITE DUCTS DO A BETTER JOB AT LESS COST:

**1. Corrosion-Resistant.** Transite, being made of inorganic asbestos and cement, resists corrosion and is immune to electrolysis.

**2. Permanently Smooth Bore.** Transite makes long cable pull easy. Danger of damage to cables is also minimized.

**3. Incombustible.** Transite will not burn nor contribute to formation of smoke, gases, or fumes . . . confines burn-outs and protects adjacent cables permanently.

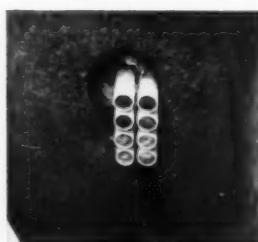
**4. Higher Thermal Conductivity.** Cables run cooler in Transite, reducing IR losses, increasing current capacity and prolonging insulation life.



**Easy to Handle:** Working in a deep trench, this man finds that the light weight of Transite Ducts helps him work without undue strain.  
\*Reg. U. S. Pat. Off.



**Speeds Installation:** Transite Ducts are joined so rapidly that the assembly man can often follow right behind the trencher . . . as shown in this installation.



**Speeds Distribution:** The light weight of Transite Conduit enables the contractor to haul a large number of ducts per truck and speed distribution on job site.

**Cuts Manhole Costs:** Concrete will be poured directly around these Transite Ducts to form the manhole wall, a time and material saving made possible by Transite's strength.



## Johns-Manville TRANSITE DUCTS

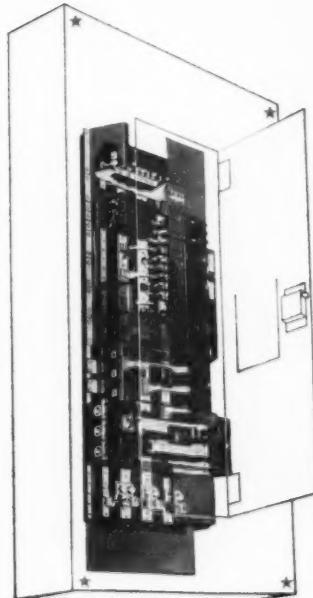
TRANSITE KORDUCT—for  
installation in concrete

TRANSITE CONDUIT—for exposed work and installation  
underground without a concrete encasement

**PRODUCTION  
CHANGE-OVER TIME WON'T  
MELT AWAY WITH . . .**



## *Screwdriver Convertibility*



Outmoded circuit protection and slow change-over can inflict double penalty on production schedules today.

It's easy to make necessary circuit changes on the job with Westinghouse Circuit Breaker Panelboards—safely, quickly.

First, indicating trim clamps make it easy to get the trim off. Since change-over parts are die-dental, a precise fit is insured. Pretapped busbars and back pans eliminate any necessity for drilling, tapping or machining.

Screw driver convertibility is a feature of the big Westinghouse Nofuze® Convertible Distribution Panelboard, but is also available in all Westinghouse "De-ion®" Panelboards.

For complete information call your Westinghouse representative, or write for DB-30-930 containing complete data on Westinghouse Lighting and Distribution Panelboards, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

J-93467

YOU CAN BE **SURE** . . . IF IT'S  
**Westinghouse**  
**PANELBOARDS**



# RICHARDSON-ALLEN

## DEPENDABLE SELENIUM RECTIFIERS

For Dependable DC Power

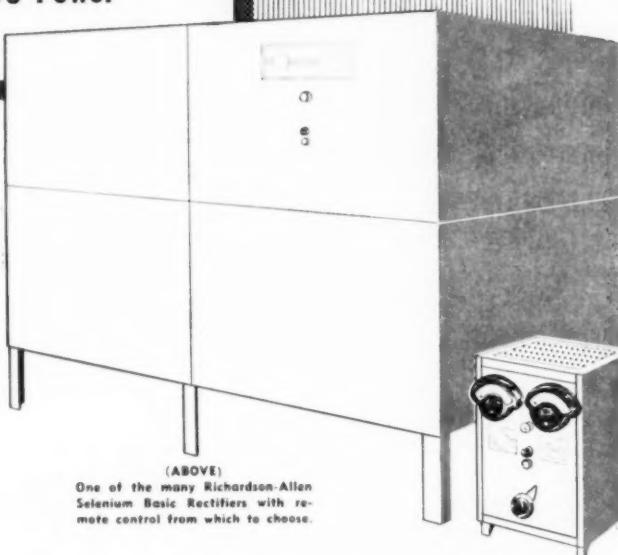
The electrical contractor who provides his customers with Richardson-Allen Selenium Rectifiers for power conversion provides the best and most economical installations possible.

With no change in existing wiring, these Rectifiers deliver dependable DC power for all motors, including those used for PASSENGER and FREIGHT ELEVATORS.

Outstanding features are high efficiency under varying loads—indifference to sudden overload—thermostatic protection—minimum standby losses, power factors of 96% and high efficiencies.

Hook up a Richardson-Allen Selenium Rectifier and, like Tennyson's Brook, it will "GO ON FOREVER!"

Dependable Richardson-Allen Selenium Rectifiers are ideal for high intensity spot lights used in arenas, auditoriums and theaters. They eliminate costly and wasteful ballast resistors. A small inexpensive rectifier for



(ABOVE)  
One of the many Richardson-Allen Selenium Basic Rectifiers with remote control from which to choose.

each spot light assures maximum flexibility.

Richardson-Allen Selenium Rectifiers range from 1 kw to 150 kw in a single cabinet.

Rectifier cubicles may be connected in parallel to obtain any power requirement.

Installation list of hotels, office buildings and factories sent on request

## WESLEY BLOCK & COMPANY

39-15 MAIN ST., FLUSHING, N. Y.

Richardson-Allen of Canada, Ltd., 370 Victoria Street, Toronto, Ontario, Canada



DEPENDABLE POWER FOR EVERY DC NEED



When you need tape -  
here's your **GUARANTEE** of

# ACCURATE

QUALITY ELECTRICAL

## TAPES



**Non-Deteriorating  
Easy Tear-Off  
High Tensile Strength  
Maximum Dielectric**

**BLUEPRINT FOR KNOW-HOW!** For over a quarter century, ACCURATE Tapes have enjoyed a reputation for quality among electrical men, everywhere. One reason for this steady demand is the modern plant that economically mass-produces the finest tape that money can buy. ACCURATE specializes in tape making—combining finest materials with experienced methods. ACCURATE tapes for the electrical industry are of consistent excellence—a consistency reflected in every roll bearing the familiar ACCURATE label. The next time you need tape, you'll find it's good business to make yours ACCURATE! For complete catalog, call or write the Accurate Mfg. Co. at Garfield, N. J.—Dept. G.

### ACCURATE FRICTION TAPES



Quality made of highest grade rubber and finest cotton base. Affords maximum mechanical protection. Available in Standard and A.S.T.M.-A.A.R. Specification grades.

### ACCURATE RUBBER TAPES



Offers high elasticity, excellent cohesion, high dielectric strength and super aging qualities; made in both Standard and A.S.T.M.-A.A.R. grades.

### ACCURATE PLASTIC TAPE



Thin coating reduces bulk in tight spots. Strong mechanically and offers high dielectric strength. Recommended for use wherever plastic tape is practical.



### TAPE TIPS: FOR ELECTRICIANS

Use rubber tape that coheres without heat or extra pressure. That's Accurate Tape! Easier to apply and actually improves with age. Remember—it's Accurate Rubber for greater electrical strength, Accurate Friction for positive mechanical protection!

# ACCURATE

YOUR BEST BUY IN TAPE

MORE THAN A QUARTER CENTURY OF TAPE SPECIALIZATION



# Lights ON at Sunset!

... when Sangamo Time Switches are equipped with the Astronomic Dial, they adjust for seasons day by day



**SANGAMO ELECTRIC CO.**  
SPRINGFIELD, ILLINOIS



Sangamo Heavy-Duty Time Switches can be furnished with the Astronomic Dial which automatically controls the ON and OFF operations of the time switch in accordance with the change in seasons for any given latitude. Consequently, electrical circuits can be turned ON at sunset and OFF at sunrise, or earlier if desired, with automatic daily compensation as the hours of daylight and darkness change. This feature is particularly suitable for the control of lighting for outdoor advertising, display windows, street lighting or protective floodlighting.

Sangamo Heavy-Duty Time Switches are built to give many years of exceptionally dependable switching with complete freedom from maintenance worries. There are many good reasons — a few are listed below.

#### LOW-SPEED MOTOR . . .

The exclusive Sangamo low-speed motor (450 R.P.M.) means less wear . . . more years of service.

#### LIFETIME LUBRICATION . . .

A special grease assures perfect operation from 50° F. below zero to 200° F. above. No special coils are needed.

#### OVERSIZE SILVER

**CONTACTS . . .** The pure silver contacts minimize troublesome arcing by combining a slow break with a narrow gap.

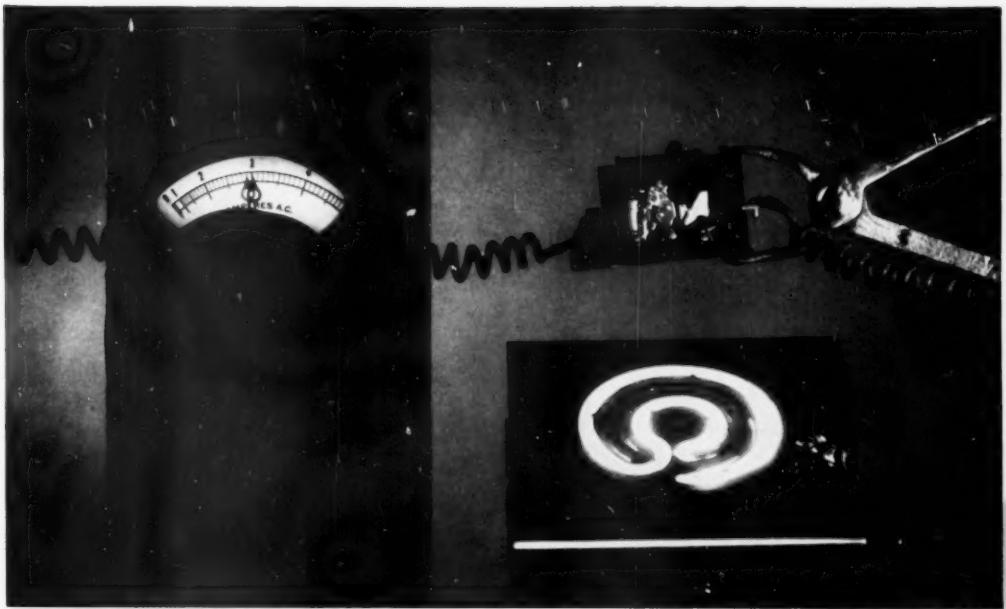


#### MACHINE-CUT GEARS . . .

The heavy gears are precision-cut—not stamped. They transmit power smoothly and possess strength in excess of any service requirements.

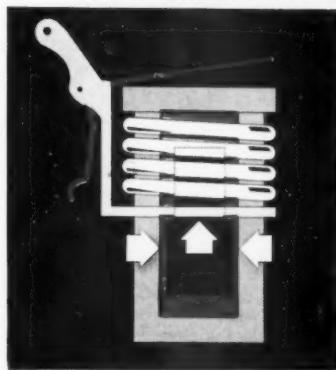
\* \* \*

Choose from Sangamo's complete line of time switches. . . . Get them at your (sign supply house or) electrical wholesaler. Get the full story—write for Catalog No. 1010A today.



Laboratory demonstration shows 30 amperes continuously flowing through 30 ampere Heinemann Circuit Breaker held over hot plate.

## the one circuit breaker principle ... THAT IGNORES **HEAT!**



The **FULLY MAGNETIC** Principle

One magnetic coil is the entire actuation of HEINEMANN Circuit Breakers. Thermal warp elements are eliminated. On short circuits, the coil instantly trips the breaker. On small overloads, a time delay is introduced while the movable core is drawn toward the pole piece, increasing the magnetic flux. Moreover, the time delay is proportioned to the overload . . . being shorter for large overloads . . . and longer for small ones.

HEAT . . . the downfall of most circuit protection equipment . . . will not alter the performance of Heinemann Circuit Breakers. You can locate Heinemann Circuit Breakers in hot kitchens, boiler rooms, or near steam pipes without fear of false tripping. With Heinemann, current is the only consideration . . . and current (not heat) trips the breaker. There is no need for de-rating . . . never nuisance tripping, yet Heinemann provides the fastest circuit interruption available for short circuits and proportioned response for overloads.

Performance and dependability to this extent explains why better contractors are using Heinemann Circuit Breakers on their jobs.

Send for complete literature. HEINEMANN ELECTRIC COMPANY, 132 Plum Street, Trenton 2, N.J.

**don't use heat . . . USE POWER**

**HEINEMANN**

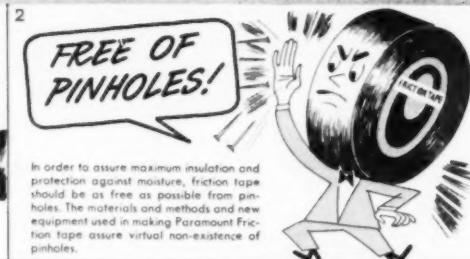


HEINEMANN Circuit Breakers . . . One, two and three pole . . . 10 milliamps to 100 amperes

# PARAMOUNT FRICTION TAPE by Haartz-Mason



Made under the most exacting requirements in the industry, Paramount Friction tape can be tightly wrapped — yet can be torn readily as required. A margin of safety in this respect is added to every roll of Paramount Friction tape.



In order to assure maximum insulation and protection against moisture, friction tape should be as free as possible from pinholes. The materials and methods and new equipment used in making Paramount Friction tape assure virtual non-existence of pinholes.



Automatically cut with smooth, neat edges on Cameron cutting machines. These machines wind it on the cores under tension. This is your insurance against ravelling.



Under controlled temperature and humidity, Paramount Friction tape is strictly tested for permanence of adhesion.



Taken from stock at regular intervals, sample rolls of Paramount Friction tape undergo accelerated aging tests in an electric oven at 212°F. for 16 hours. Thus you get a guarantee of maximum aging ability.



Every roll of Paramount Friction tape is sold with guaranteed minimum footage per roll plus... guaranteed weight. You are left in no doubt about what you are getting. And so you know you will cover the largest area most efficiently at the lowest cost.



To sum up, Paramount Friction tape, besides being made of finest materials, also undergoes rigorous pre-testing at the factory. Among the rigidly conducted tests are those for aging, adhesion and strength.



Manufactured by  
**Haartz-Mason, Inc.**  
WATERTOWN 72, MASS.





# HERE'S THE NAMEPLATE.. To Look For On Mercury Lamp Transformers



Jefferson Transformers have fittings at top and bottom for conduit and suspension mounting.



Two-lamp high power factor Transformers provide economy in first cost and installation. Two transformers in one.



Both single and two-lamp Transformers are available, each with three primary taps to permit matching to line voltage for best possible lamp performance.

Complete line of outdoor transformers in deep-drawn one-piece weatherproof enclosures.

## Made by Transformer Specialists

At Jefferson, the manufacturing of transformers has been carried on for over 35 years. They include types for use with all forms of modern lighting, —neon tubing, fluorescent and mercury vapor.

This long experience plus engineering and research, modern manufacturing facilities and technique produce Mercury Lamp Transformers widely acknowledged for their high uniform quality. They are made to meet the requirements of leading lamp manufacturers.

You gain most from the mercury lamps you install by using Jefferson Transformers, liberally designed and made specifically for this service. Correct starting and operating characteristics are provided and the control of voltage and current required for the best possible lamp life and brilliancy.

When selecting transformers look for the Jefferson nameplate and trademark.

Write for Bulletin 521-5

**JEFFERSON ELECTRIC COMPANY**  
Bellwood, Illinois

IN CANADA: Canadian Jefferson Electric Co., Ltd.,  
384 Pape Ave., Toronto, Ont.



# JEFFERSON TRANSFORMERS

ACCORDING TO CHAPTER 10, TABLE 1  
OF THE NATIONAL ELECTRIC CODE...

# 1 CM of COPPER INSULATED WITH A.V.C.<sup>®</sup>

Does the work of  
1.6 CM of Copper  
with type RH

This Means You Save 4 Ways:



**USE SMALLER CABLE**  
to carry the same ampere load, or  
carry a greater load with the same  
size cable.



**SAVE ON CONDUIT**  
because A.V.C. cable is smaller, or  
carry more current per conduit.



**SAVE ON FITTINGS**,  
bushings, couplings, terminators,  
connectors, etc., because you use  
smaller cable.



**SAVE ON LABOR**  
because A.V.C. is lighter and  
smaller. You can pull it through  
conduit easier, faster and cheaper.

Write for booklet "Cut Current  
Carrying Costs."

TABLE OF CURRENT CARRYING CAPACITIES

CM	Type AVA	Type RH
250000	296	224
300000	324	251
350000	367	273
400000	395	295
500000	442	334
600000	494	370
700000	526	405

Ambient Temperature 40°C-104°F



It's the  
**A.V.C.**  
"Sandwich" That  
Makes The Difference

OUTER FELTED ASBESTOS WALL

VARNISHED CAMBRIC

INNER FELTED ASBESTOS WALL

This "sandwich" protects the  
varnished cambric. It enables  
A.V.C. to carry more current  
than cables with conventional  
insulations.

ROCKBESTOS PRODUCTS CORPORATION, NEW HAVEN 4, CONN.

The originators of A.V.C.<sup>®</sup>

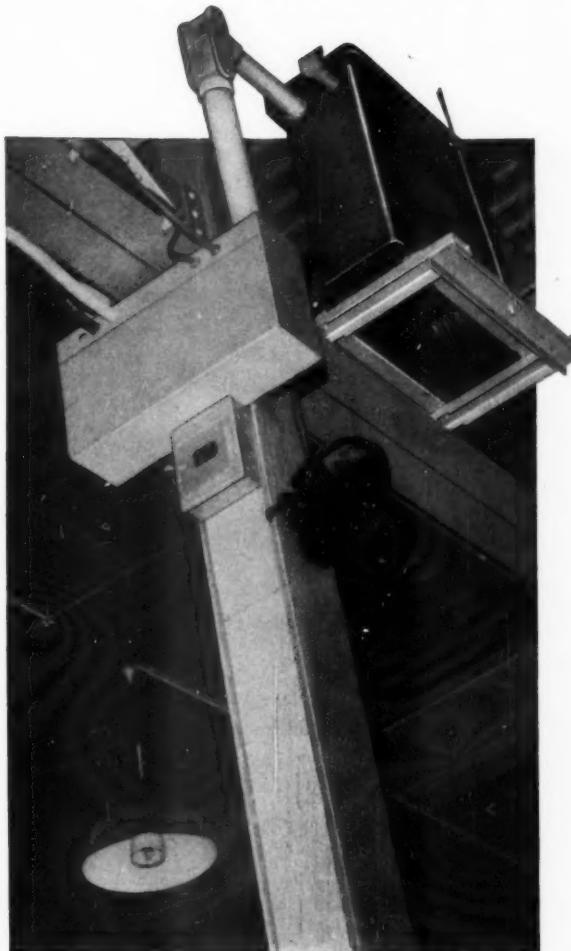
New York • Cleveland • Detroit • Chicago • Pittsburgh • St. Louis  
New Orleans • Los Angeles • Seattle • Oakland, California



...Your best buy

**This Transformer must be**

*Maintenance-Free*



From an electrical engineer's viewpoint, it's essential to install lighting transformers in locations like this, close to the center of the load. But, from the point of view of your maintenance staff, it could be a problem. Westinghouse Dry-Type Transformers solve that dilemma. They're *maintenance-free*!

They have no liquids to recondition or replace, no valves, gaskets, or mechanical devices. With complete simplicity of design, they eliminate ordinary transformer maintenance problems!

They offer other advantages, too. Because they are built around Hipersil® cores, they are smaller, lighter, easier to install. Some models, with circuit-breakers built in, dispense with the need for separate protective devices. Available in a wide range of ratings to serve both light and heavy machinery as well. For complete information, check with your distributor, your Westinghouse representative, or write direct for a copy of booklet B-4439 Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-70615



YOU CAN BE **SURE**...IF IT'S  
**Westinghouse**

**DRY-TYPE  
TRANSFORMERS**

# HUNDREDS OF WHOLE MILLIONS OF

IT'S THE SAME with wholesalers everywhere . . . their Stab-lok sales are terrific . . . they've sold Stab-loks by the millions! Wherever you are located, there's a nearby Stab-lok wholesaler . . . and more wholesalers are adopting the line all the time. Federal Noark Stab-lok is setting new sales records every month!

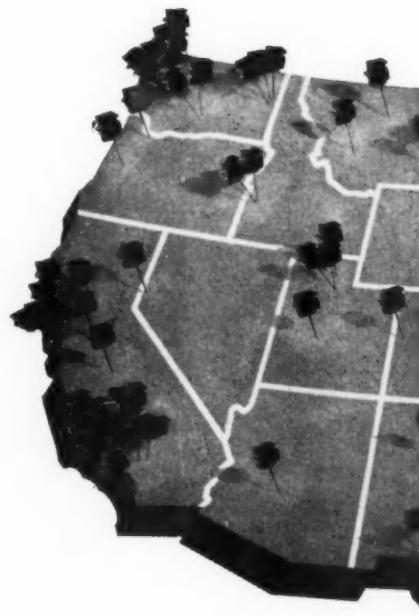
Stab-lok is the lowest priced circuit breaker of absolutely proved dependability. It brings the safest, most convenient overload protection *at the lowest cost*. It's easy to install. You can usually count on quicker deliveries than of other breakers. And Stab-lok is a natural as a stock item for your shop and trucks.

Cash in . . . order Federal Noark Stab-loks *now* from your wholesaler!

**STAB-LOKS** pass the same exacting Underwriters' Laboratories electrical tests as the highest priced A. C. circuit breakers. And now mechanical comparisons of the five most popular breakers give still further proof that Stab-lok gives you most for your money.

- Stab-lok is a BIG, FULL-SIZE BREAKER!
- Stab-lok has FEWER and MORE RUGGED parts!
- Stab-lok uses metal where it counts — CARRYING CURRENT!

. . . a whole combination of features that makes Federal Noark Stab-lok the best circuit breaker at any price.



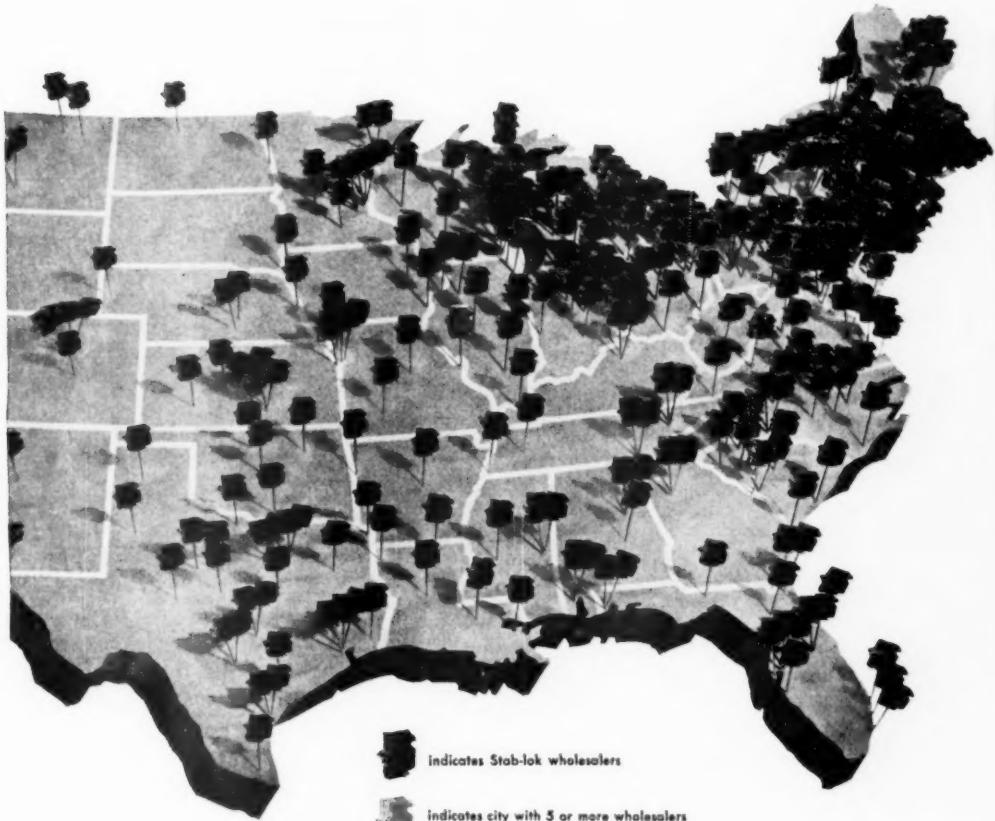
INDEPENDENT LABORATORY TESTS OF FIVE POPULAR CIRCUIT BREAKERS SHOW:

Brand	Total No. of Parts	No. of Fibre Parts	% Total Weight	% Total Weight of Case and Handle	% Total Weight of Metal Parts	% Total Weight of Current Carrying Assemblies
<b>STAB-LOK</b>	<b>22</b>	<b>1</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
C	31	5	82.2	76.8	88.0	53.8
E	24	2	83.8	80.4	83.3	48.7
B	28	1	85.4	56.0	97.6	48.7
D	31	5	82.2	76.8	88.0	53.8

# SALERS HAVE SOLD

# Stab-loks

REGISTRATION APPLIED FOR



FEDERAL ELECTRIC PRODUCTS COMPANY

50 PARIS STREET, NEWARK 5, NEW JERSEY

## FEDERAL NOARK

Complete line of Federal Electric Products includes Motor Controls, Safety Switches, Service Equipment, Circuit Breakers, Panelboards, Switchboards, Control Centers, Bus Duct ★ Sales offices in principal cities.



# STRENGTHENING YOUR "GOOD RIGHT ARM"

We've reprinted the advertising index of the January issue of ELECTRICAL WHOLESALING to illustrate how manufacturers are helping your wholesaler's salesman to help you.

Through advertising in ELECTRICAL WHOLESALING these manufacturers deliver essential product and sales information to electrical wholesalers and their salesmen. Armed with this information your wholesaler's salesman is better able to explain the latest products, advise on availability, recommend the proper equipment for your specific jobs . . . handle your orders more quickly and more intelligently.

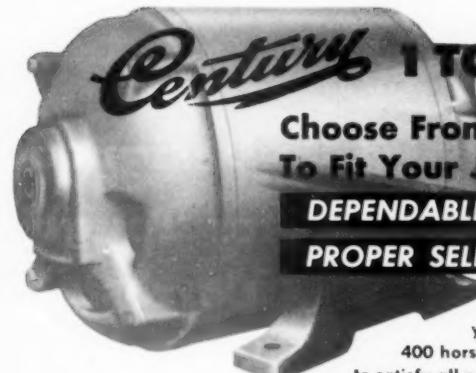
A good wholesaler's salesman is a reliable source of information and assistance — a good right arm, no farther away than your telephone — whose primary interest is to help you conduct a more efficient and profitable business.

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Alert electrical wholesalers and their salesmen read  
ELECTRICAL WHOLESALING —  
The National Magazine of Electrical Wholesale Distribution.

A McGraw-Hill Publication  
330 West 42nd Street, New York 36, N.Y.



# Century 1 TO 400 H. P. MOTORS

Choose From These Many Types  
To Fit Your Job

DEPENDABLE CONSTRUCTION . . . Plus

PROPER SELECTION MINIMIZE SHUTDOWNS

It's easy to select the proper electric motor for your job from Century's complete line — from 1/8 to 400 horsepower. A wide range of types of kinds are available to satisfy all popular requirements. They are carefully designed, built and tested to assure maximum performance throughout their long life.

Here are examples of Century's line of INTEGRAL HORSEPOWER motors.

#### Polypole

**TYPE SC**—Open Drip proof General Purpose Motor. Meets the needs of most installations where operating conditions are relatively clean and dry.

**TYPE SC**—Splash proof. Supplies protection where plants must be washed down. Keeps out all falling or splashing liquids—rain, snow, sleet, etc.

**TYPE SC**—Totally Enclosed Fan Cooled. Protects against dusts, mist, oil, fog. Inner frame protects vital parts of the motor, seals out harmful matter.

**TYPE SC**—Explosion proof. Protects life and property in atmospheres charged with explosive dusts or gases.

**TYPE SR**—Wound Rotor. Open Construction. Ideal for applications requiring low starting current with high starting torque, reversing or adjustable speed.

**TYPE SR**—Wound Rotor Splash proof. Same electrical characteristics as motor shown above. In addition, gives adequate protection against falling and splashing liquids.

#### Single Phase

**TYPE RS**—Repulsion Start Induction, Open Construction, Single Phase Brush Lifting Motor. Combines high starting torque with low starting current.



**TYPE RS**—Splash proof. Same advantages as open construction, plus protection against splashing and falling liquids.



**TYPE CSH**—Capacitor Start Induction, Single Phase Motor. Suitable when high starting torque with normal starting current is satisfactory.



**TYPE CSH**—Splash proof. Same advantages as motor shown above, plus protection against falling and splashing liquids.



#### Direct Current

**TYPE DN**—Direct Current Motors. Suitable for use where direct current is available, or its use desirable.



**TYPE DN**—Direct Current, Splash proof.



**TYPE SY**—Synchronous. Suitable for continuous operation at a uniform load for power factor correction.

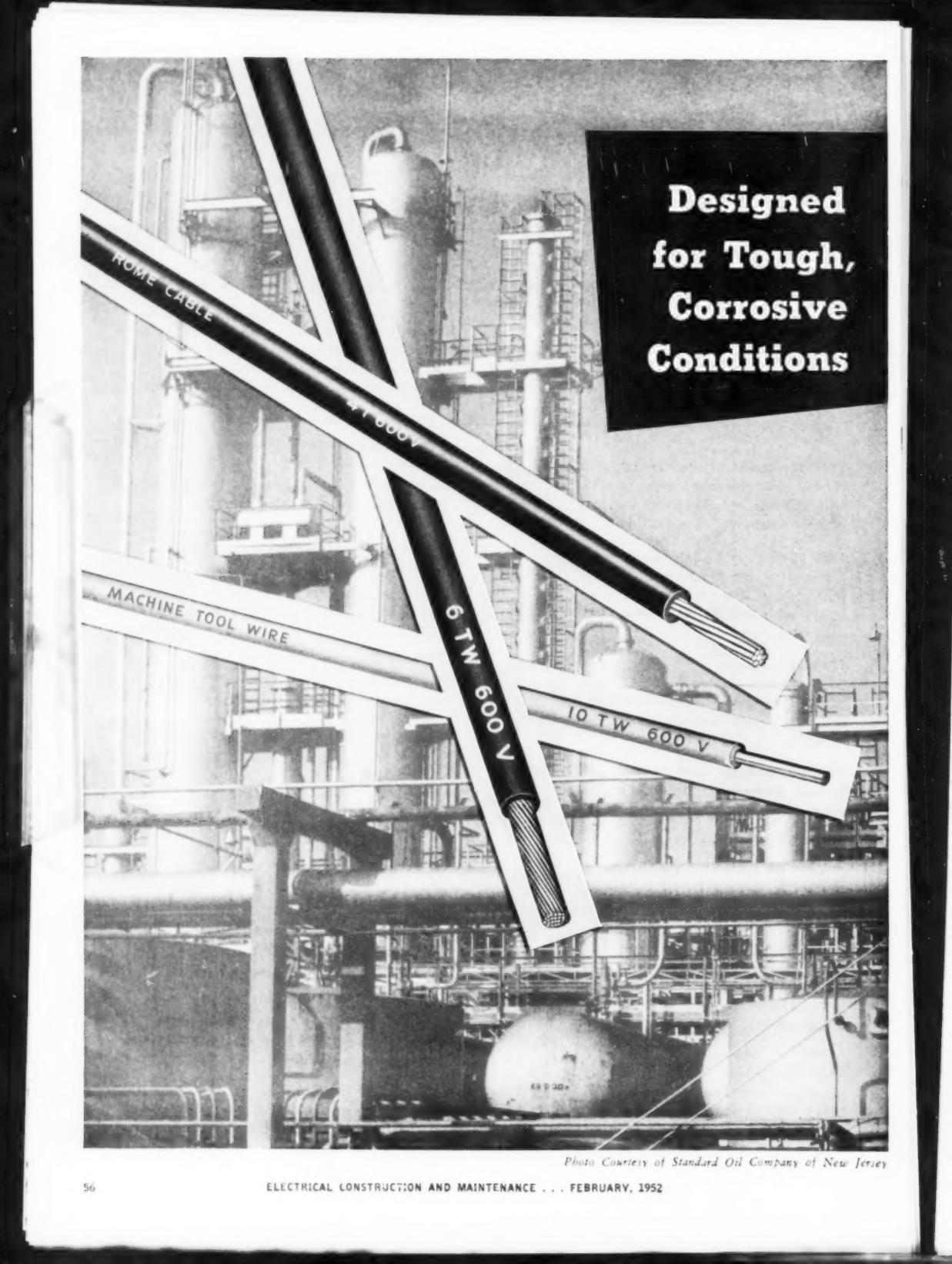


In addition to a complete line of integral horsepower motors, Century offers fractional horsepower motors, gear motors, generators, AC and DC motor generator sets.



For a long life of satisfactory performance, specify Century motors for all your electric power requirements.

**CENTURY ELECTRIC COMPANY**, 1806 Pine Street, St. Louis 3, Missouri • Offices and Stock Points in Principal Cities



**Designed  
for Tough,  
Corrosive  
Conditions**

*Photo Courtesy of Standard Oil Company of New Jersey*

# Rome Synthi<sup>ol</sup><sup>®</sup>

## WIRES AND CABLES

Whenever you are selling or installing plant wiring, you'll find Rome Synthi<sup>ol</sup> thermoplastic insulated wires and cables are sure to build your reputation for handling quality products. They are manufactured to withstand tough, corrosive conditions like those encountered in the chemical or petroleum industries.

This rugged, polyvinyl chloride type insulation has proven its ability to resist acids, moisture, abrasions, corrosive fumes, flame, oils and cutting solutions. Colors remain permanently clear for quick, easy circuit identification.

What's more, Rome Synthi<sup>ol</sup> assures quick, easy, economical installation. Its lubricated surface makes it easy to pull. It's easy to strip, too. And, its small diameter, high dielectric strength and excep-

tional aging characteristics make it ideal for industrial wiring circuits.

**Rome Synthi<sup>ol</sup> Type TW** small diameter building wire is approved by the Underwriters' Laboratories for use in wet locations under the rules of the National Electrical Code.

**Rome Synthi<sup>ol</sup> Machine Tool and Control Wire** has been adopted as standard wiring material by machine tool manufacturers for extreme durability and excellent resistance to heat, oils, acids, alkalies, common cutting solvents, etc. Underwriters' Laboratories approved as Type TW, with end use approval for 80° C. operation in air; 60° C. where exposed to oil and in wet locations. Conforms with National Machine Tool Builders' Assoc. Standards.

### For Steel Mills, Chemical Plants, Oil Refineries and Other "Hot Spots" . . . **Rome Synthi<sup>ol</sup> 901**

Here's the ideal insulation for the equipment wiring of steel mills, chemical plants, oil refineries and other "hot spots." A resin plasticized polyvinyl chloride type of insulation, Rome Synthi<sup>ol</sup> 901 provides superior service life under high operating temperatures. It also offers high resistance to oils and chemicals. It is Underwriters approved for 600 volts at 90° C., when used as an appliance lead wire.

Copper wire mill products are a Controlled Material under N.P.A.  
Controlled Materials Plan . . . USE YOUR CMP ALLOTMENT



***It Costs Less To Buy the Best***

**ROME CABLE**  
*Corporation*  
ROME - NEW YORK  
and  
TORRANCE - CALIFORNIA



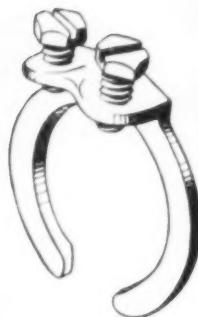
ROME CABLE CORP., Dept. EC-2 Rome, N. Y.  
Please send me the Rome Synthi<sup>ol</sup> Bulletin 101.

Name \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_



# Make APPROVED box-to-conduit grounds this LOW-COST way

Just slip a T & B Grounding Wedge  
over the wires—and clamp it in place  
quickly . . . easily . . . lastingly . . .

#### HERE'S WHAT YOU GET

With these T & B Grounding Wedges, you get *triple* assurance of continuity bonding to ground, because . . .

1. Bonding screw bites firmly into bushing, for a tight wedge and a lasting bond
2. Flange fits snugly between box wall and conduit threads
3. Springy bronze body maintains high-conductivity path to ground.

And with these universally approved fittings, you get quick inspection OK's.

#### HERE'S HOW YOU SAVE

You can slip the wedge right over old wiring, without disturbing it at all. You turn it so screws are easy to tighten. You do away with inside lock-nuts—and most of the time, with bonding jumpers too.

(If you do need a jumper, just connect it to the bonding screw.)

You convert standard bushings, of all conduit sizes, to approved grounding bushings in a few seconds, with ordinary tools.



THERE'S A



PRODUCT

for every  
wiring job  
in the  
complete T & B  
line of fittings  
for all  
conductors and  
raceways.



**ENGINEERED RIGHT . . . DISTRIBUTED RIGHT!** Grounding Wedges are typical of the many T & B quality fittings recently re-designed to give you outstanding performance at lowest installed costs. Like all T & B fittings, they're furnished under the T & B Plan 100% through your local T & B distributor. For further information or samples, see your local T & B distributor, or write us.

**THE THOMAS & BETTS CO.  
INCORPORATED**

34 Butler Street  
Elizabeth 1, New Jersey



MANUFACTURERS OF ELECTRICAL FITTINGS SINCE 1898

# Washington Report

**Inflation is a major economic threat**, almost as serious as the problem of national defense, most Washington officials believe. Price, wage and credit controls, and tax increases have effectively stabilized inflation in recent months. But they believe factors making for inflation will grow stronger in 1952, making the task of stabilization more difficult. This means controls will be extended under DPAct until mid-1953, at least.

**Highlights of DPA-NPA progress**, outlined in year-end review: 1952 production of military goods expected to double 1951 total—to \$50-billion annual rate; airplane production will increase 115%; electronics production due to rise 268%; machine tool industry will jump from \$305-million in 1951 to \$800-million rate; lack of ferrous and non-ferrous scrap may slow down many mills and foundries; most difficult production problem will be short copper supply—no substantial increase in prospect.

**Steel and copper scrap shortages** are limiting total national production, had forced eleven blast furnaces out of action in early January. Mobilization officials are highly concerned, urge all industries to cooperate fully in scrap collection to maintain full mobilization progress. Monthly steel scrap needs are three million tons to support present steel capacity production. Copper scrap is needed to maintain full use of total annual supply which is at a fairly static rate.

**Copper will remain in short supply** for five or more years, NPA estimates. But new copper-producing facilities expected to be ready beginning in 1953 will increase supplies about 250,000 tons annually over present supply of 1,600,000 tons, of which about 500,000 tons is imported.

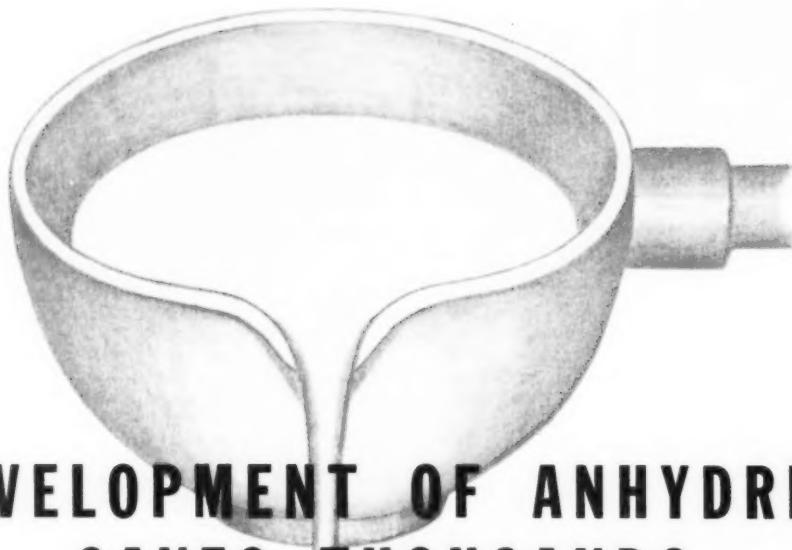
**Power switchgear equipment producers** will get more controlled materials for 2nd quarter production, NPA recently advised industry members at an IAC meeting, to meet essential requirements of utilities industry and of new and expanding defense plants. A DEPA official estimated electric power expansion for defense facilities at 68% in 1952, 42% in 1953 and 18% in 1954 over the 1951 rate, requiring similar increases in power switchgear.

**Lighting equipment volume** will probably decline some 15% to 25% during 1952 from 4th quarter 1951 rate. Reason: severe curtailment of commercial construction, which uses more dollar-value of lighting per dollar-value of construction than industrial, 1952 market for lighting. But total 1952 volume will still exceed pre-Korea rate, as 4th quarter 1951 volume was more than double highest quarterly average for year preceding Korea.

**New construction starts** will be virtually nil during the 2nd quarter, NPA told the Construction IAC recently. But essential structures already under construction, industrial and commercial, will get sufficient materials for completion in the 2nd and succeeding quarters to the extent materials are available after military demands have been met.

A new construction order which would combine all construction controls in one regulation is now under consideration by NPA. Among other provisions it would 1) limit dollar value of "B" products on self-authorization of construction materials 2) restrict use of DO-ratings for machine tools by builders.

Employment in contract construction was 2.7-million in October 1951, and continued at an all-time peak for the season through December.



## DEVELOPMENT OF ANHYDREX SAVES THOUSANDS OF TONS OF LEAD

Research sometimes pays large and unexpected dividends. When Simplex was developing the first rubber-jacketed underground cable, our object was to eliminate the use of lead in order that you might have lighter cables, ones that were easier to install, and were very much easier to splice.

Now it appears that another dividend, unexpected but valuable nevertheless, has accrued from this research work. In fact, the development of the first rubber-jacketed underground cable has opened the door to enormous savings of one of our vital national resources.

Today millions of feet of cables that without Simplex research would have required thousands of tons of lead for cable sheaths, are operating dependably in all types of jobs, from airport lighting to railway signaling. Instead of being used for cable sheaths this lead can now be used for much more important service for everything from storage battery plates to tetraethyl lead for gasoline.

ANHYDREX is only one of many improvements in the art of cable manufacture to come out of Simplex Research and Development Laboratories.

**SIMPLEX ANHYDREX**  
SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.

# FEBRUARY . . . at a Glance

## Appliance Outlook

Appliance sales have a direct influence on the wiring market. They create rewiring jobs. They determine wiring requirements for home and apartment building. So Bob Armstrong's projections for the coming year of appliance sales are significant data for electrical contractors. His article, "Customer Shortage Hurts Appliance Sales," on page 76, is supported by data from the authoritative annual market analysis statistics of Electrical Merchandising.

## Aluminum Conductors

On page 90 is the concluding article of a series of two on the question, "Is Aluminum the Answer?" to the copper shortage. The facts and opinions expressed are the boiled down essentials of a great many interviews with experts, conferences and papers on a highly controversial subject. We do not expect that everyone will concur with the conclusions drawn. But whether you do or not, we cordially invite your comments on this vitally important question.

## New Light

The incandescent lamp is essentially a "point" source, the fluorescent lamp a "line" source of light. Now comes a new source, electro-luminescence, which gives

light from a plane surface or area, opening up new avenues of potential lighting application. B. C. Cooper describes this milestone in lighting progress on page 82 in the first of a series of articles on the radically new light sources which are coming on the market.

## When Jobs Lag, Profits Skid

Probably one of the most disturbing experiences an electrical contractor can have is to watch his estimated profit on a job dwindle to nothing as the work reaches completion. Everything was operating smoothly, work was well ahead of schedule and the profit picture was extremely promising. Then suddenly comes the rude awakening.

This story is as old as the electrical construction industry. It happens every day. In fact, it happens much too often and to too many contractors to be nonchalantly regarded as part of the calculated risk inherent in competitive bidding. There must be some underlying reason. Does the fault lie with estimating, management, supervision, or the mechanics?

If you were to study the subject of "trim" labor used to complete a job, you would find that no one single factor can be held responsible for job lag. Rather, a combination of factors ranging from top management down to job crew level affect this condition. In his article "Watch Your Trim Labor" on page 78 research and consulting engineer Ray Ashley tells why jobs lag at the end and how to avoid this pitfall.

## DATES AHEAD

**15th Annual Electrical Industry Convention and Trade Exposition**—North Central Electrical Industries, St. Paul Hotel, St. Paul, Minn., Feb. 24-28.

**National Electrical Manufacturers Association**—Edgewater Beach Hotel, Chicago, Ill., March 10-13.

**National Industrial Service Association**—Quarterly meeting of Mid-South Chapter, Nashville, Tenn., March 15.

**Sixth Annual Industrial Electrical Show**—Sponsored by Electrical Maintenance Engineers Association of Southern California, Veterans' Memorial Building, Culver City, Calif., March 20-22.

**Edison Electric Institute**—18th Annual Sales Conference, Edgewater Beach Hotel, Chicago, Ill., March 31-April 3.

**Massachusetts Electrical Contractors Convention Authority Tool Exhibit**—Under the auspices of the Mass. Electrical Contractors Association and the New England

Chapters of NECA, The Bradford Hotel, Boston, Mass., April 16-18.

**National Industrial Service Association**—Annual convention, Stevens Hotel, Chicago, Ill., April 20-23.

**Industrial Electrical Exposition**—Thirteenth annual equipment show sponsored by the Electrical Maintenance Engineers of Milwaukee, Public Service Building Auditorium, Milwaukee, Wis., April 24-25.

**Chamber of Commerce**—Annual meeting, Washington, D. C., April 28-30.

**4th International Lighting Exposition and Conference**—Cleveland Municipal Auditorium, Cleveland, Ohio, May 6-9.

**Edison Electric Institute**—20th Annual Convention, Cleveland, Ohio, June 2-5.

**National Association of Electrical Distributors**—Annual convention, Atlantic City, N. J., June 9-13.

**National Fire Protection Association**—Annual meeting, Hotel Statler, New York, N. Y., June 9-13.

**New York State Association of Electrical Contractors and Dealers, Inc.**—Saranac Inn, Saranac, N. Y., June 29-July 7.

**Illuminating Engineering Society**—National Technical Conference, Edgewater Beach Hotel, Chicago, Ill., September 8-13.

**International Association of Electrical Inspectors**—Northwest Section, Twin Falls, Idaho, September 11-13; Southwest Section, California Hotel, Fresno, Calif., September 18-20.

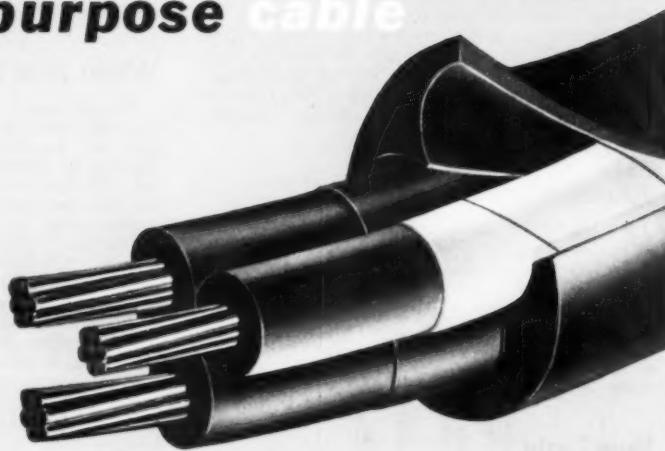
**National Industrial Service Association**—Southeastern Chapter meeting, Miami, Fla., October 24 and 25.

**National Electrical Manufacturers Association**—Haddon Hall Hotel, Atlantic City, N. J., November 10-13.

# Durasheath

## the all-purpose cable

for both  
power  
and light  
services



Durasheath's\* tough neoprene jacket stubbornly resists electrolysis, corrosion, temperature extremes, cutting, abrasion, impact, flame, oil, grease, moisture and most soil acids and alkalies.

Run it overhead, in ducts, or buried underground—or all three in one continuous run.

It's flexible, easy to handle, economical to install; made in single or multi-conductor construction.

Your nearest Anaconda Sales Office or Distributor can show you why it's good business to install this versatile, all-purpose cable. Just ask them. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

\*Trademark

**the right cable for the job**

**ANACONDA®**  
**WIRE AND CABLE**

## Case for Steel Raceways

**STEEL FOR CONDUITS** and raceways, for enclosures, cabinets and fittings is vitally essential to the mobilization of our national resources. An industry advisory committee has spelled out the need for steel for wiring to NPA. It states bluntly that "steel raceways afford protection and security of installation that no other system can offer."

**THE SUPPORTING FACTS** of the report, detailed on page 70, are well known to electrical contractors. They are basic. They are accepted by all experienced and technically qualified groups. But they are not widely known outside of this small segment of specialized knowledge.

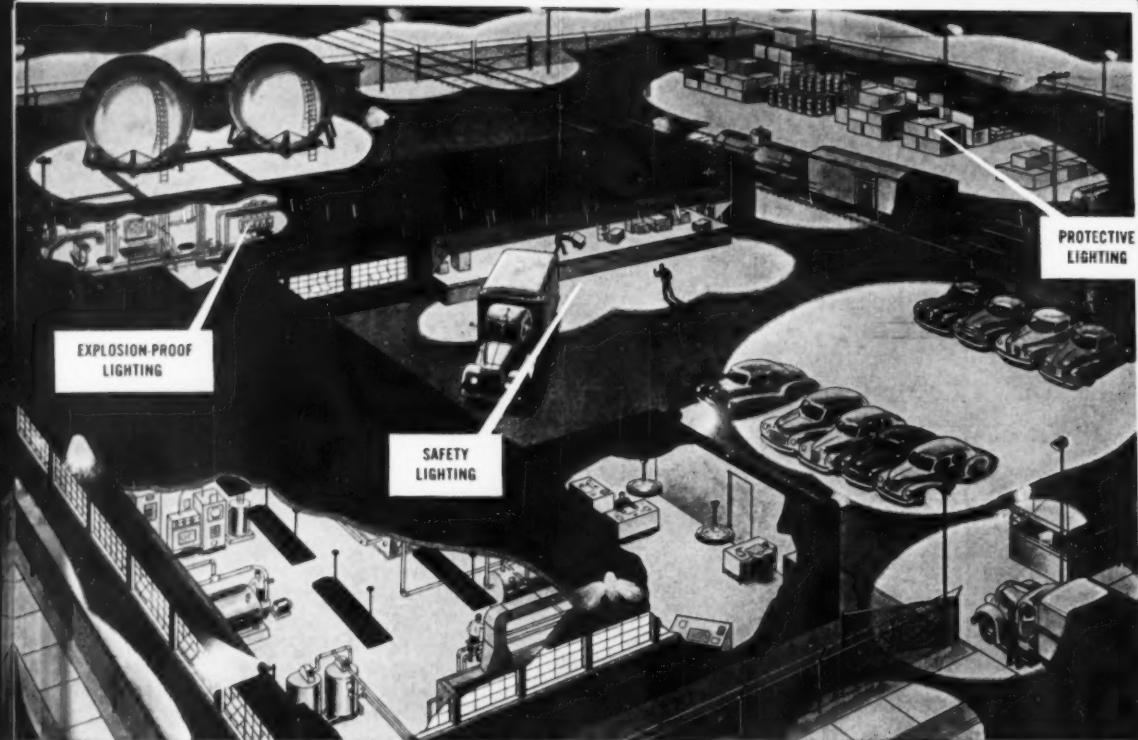
**MOBILIZATION OFFICIALS** who have large responsibilities for allocating materials to essential end uses need such facts. It is the industry advisory committee's job to make them available, and this committee has presented its case clearly and constructively.

**WE ARE STILL** in the building and facilities expansion phase of the mobilization program. It will certainly continue for two or three years, maybe indefinitely. The great production program which may be required at any time of these facilities precludes temporary standards or emergency economies of materials. Wiring must be done right. It must be ready. It must be of the highest quality and permanence.

**OTHER CONSTRUCTION**, notably institutional building, must go ahead despite mobilization limitations. Permitted work will be clearly essential. The quality and permanence of electric wiring systems in such construction are of the essence of efficient utility. Wiring must conform to the highest standards of usefulness, safety and permanence.

**GREATLY EXPANDED** electrical requirements cannot be served effectively with reduced allocations of steel for electric wiring systems. The Electric Conduit Industry Advisory Committee report on the essentiality of steel clad wiring systems ought to have the widest industry endorsement, particularly from the Electrical Contractors' Committee.

*William T. Stuart*

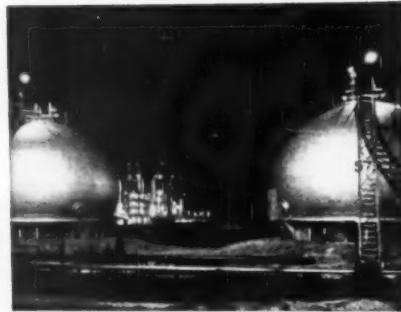


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# WIRING A Highway for Tomorrow

The 118-mile New Jersey Turnpike—with 17 toll plazas and traffic interchanges, 22 service areas containing elaborate food and fuel facilities, 6 maintenance depots, 7 radio stations, 3 police headquarters and a modern administration building—includes a \$2-million investment in power and lighting equipment. Two electrical contracting companies combined their engineering, financial and labor resources to rush this job through to completion in record time.

By Jules H. Friedland and George Scholes

Vice President  
Lightning Electric Service Company  
Newark, N. J.

Vice President  
Emerson Garden Electric Company  
Elizabeth, N. J.

**N**EWEST super highway to expand America's highspeed vehicular network is The New Jersey Turnpike. It is *not* "just another road." Rather it is an outstanding engineering achievement in planning, design and construction, created in a record 29-month period through the technical efforts of over 700 engineers, the co-ordinated skills of 10,000 workers, and the know-how of 110 companies with contracts for grading, drainage, sub- and super-structures, paving, building and electrical work.

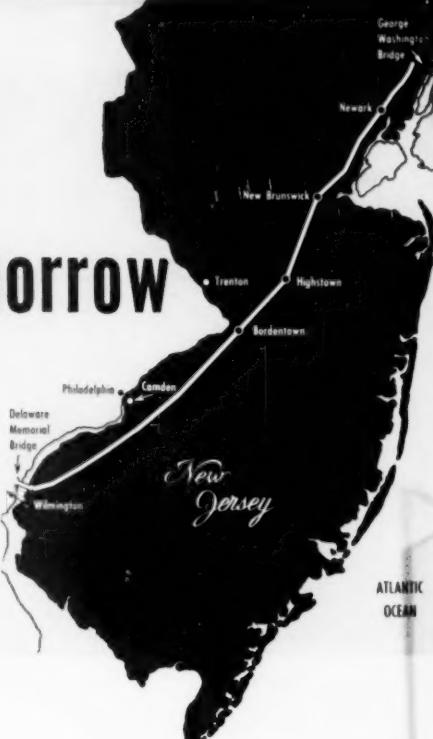
In extent, the Turnpike rolls 118 miles across the Garden State, linking the western approach of the George Washington Bridge over the Hudson to the recently-completed Delaware Memorial Bridge below Wilmington. In effect, it provides badly needed relief to the eastern seaboard's most acute traffic problem, cutting from three to five hours of travel time for passenger cars and trucks running between metropolitan New York and Philadelphia, and connecting New England throughways with the Pennsylvania Turnpike and major highways to the south. In its routing, it traverses some of the country's most densely populated and highly industrialized

sections, ducking beneath the already crowded Pulaski Skyway, overpassing scores of local streets via 2- and 3-level viaducts, threading through a complex maze of railroad yards, utility lines and industrial plants, and spanning numerous major highways, rivers, swamps and marshes.

Representing an investment of \$255-million that included \$8-million-a-mile peaks near the northern end, the Turnpike is an express route by every standard, for it is unimpeded by traffic lights, left hand turns, crossroads, drawbridges and all other impediments to fast, safe driving. No grade exceeds 3%; no curve has a radius less than 3000 feet; non-skid traffic lanes are a generous 12 feet in width, while underpasses are wide enough to permit the eventual installation of eight lanes with clearances of 15 feet—highest in the country. Designed for continuous speeds of 75 miles an hour, the Turnpike will probably carry 8 million vehicles during its first year. With this inheritance, it justly is called a Highway of Tomorrow.

## \$2-Million Electrical Contract

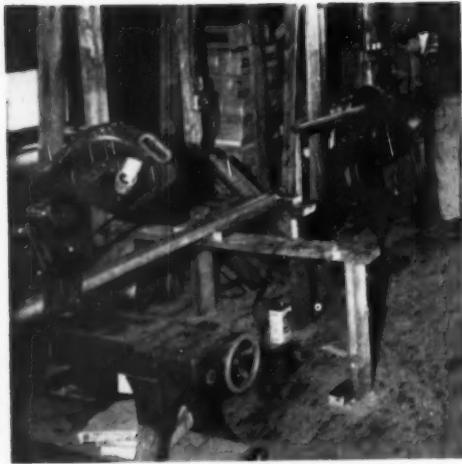
Electrically, the Turnpike represents a \$2-million investment in power and



lighting equipment installed to serve 17 toll plazas and traffic interchanges, 22 service areas containing elaborate food and fuel facilities, 6 maintenance depots, 7 radio stations, 3 police headquarters and a centrally-located administration building.

But aside from the praise-provoking lighting, the electrical scope is not readily apparent. For the miles of power and telephone cables are buried, the many substations along the right-of-way are unobtrusively compact, and all switchgear and emergency standby generating equipment is attractively housed.

Yet applications of power are numerous, including vacuum and deep well pumps, air and freon compressors for refrigeration, evaporators and condensers, supply and exhaust fans, unit heaters and oil burners, roll-up doors, dumb waiters and elevators, motorized valves and dampers. Motors, ranging from fractional to 30 hp, are all plainly identified as to use, either by tags, signs or stencilled markings. And, to further insure safety and efficiency, operating instructions are to be found on or near each piece of electrical equipment and wiring diagrams are posted inside all control cabinets. In



**MASS PRODUCTION** techniques, such as this production line for cutting, threading and bending conduit on the various jobsites, saved considerable time, manpower and money.

characteristics, all motors of 1/2-hp or greater capacity are 208-volt 3-phase; smaller units being 120-volt single phase. Controlling media include aqua-stats and thermostats, float and time

actuators, manual, automatic, photocell and electronic switches. All manual switches are quick-make quick-break 2- and 3-pole units enclosed by dead-front safety panels.



**MICROWAVE RADIO** communications system includes dual VHF directional antennas on all patrol and maintenance cars. Transmitter beam is confined to Turnpike.

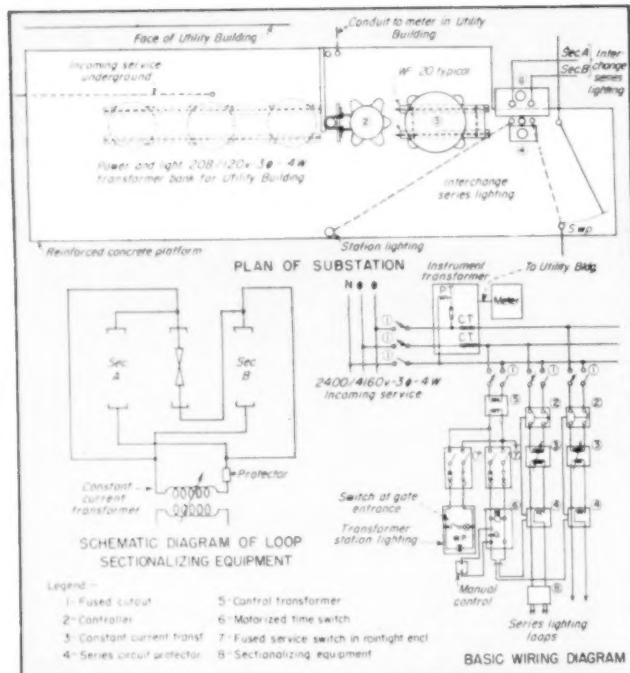
Primary service is 4160-volt 60-cycle 3-phase, delivered along the 118-mile stretch by three utility companies: Public Service Gas and Electric, Jersey Central Power and Light, and Atlantic City Electric. Utility lines are pole-mounted as far as the various substation enclosures. From there, all secondary wiring is underground, run either in asbestos-cement or threaded hot-dipped galvanized wrought iron conduit. This leaves the entire right-of-way unobstructed.

Substation transformers step current to 208/120-volts for use within the numerous Turnpike Authority buildings, and to 7.5 amps for the many constant-current series-lighting installations. They also include secondary racks with all related insulators, connectors and bus-bars, fuse cut-outs, controllers and protectors, breakers, meter panels and service switches.

Within adjacently-located utility buildings are standby engine-generators, operable through transfer switches, to provide insurance against possible utility power interruption. Standby units range from 23 to 54 hp.; average 45. Outputs correspondingly vary from 7.5 to 31 kva.; average 18.75 kva. per station for emergency use.

#### Miles of Wiring

Wiring is predominantly in rigid conduit, with galvanized supporting fittings spaced not farther than every 8 feet. Fittings are secured to masonry by brass screws, and conduits are held clear of walls to prevent possible abrasion, moisture accumulation and rust.



**SERIES CIRCUIT LIGHTING** of interchanges and service areas is served by constant-current transformers and controlled by motorized astronomical time switches.

Statistically, conduit totals over 120,500 feet; ranging from  $\frac{1}{2}$  to 4 inches in diameter.

Wire is generally RH; lead covered below ground. Smallest size is 12 gauge; 10 gauge and smaller being solid while 8 gauge and larger is stranded, connected with solderless lugs. All wire is color coded for positive identification, and neutrals are permanently grounded.

To prevent the accumulation of moisture within underground conduit, all runs are sloped and drained at low points via T condulets resting on crushed stone pads. In cases where distribution systems cross the highway and where pavement had been placed prior to the installation of the wiring, underground conduits were jacked through the highway subsoil without damaging the finished surface of the roadway.

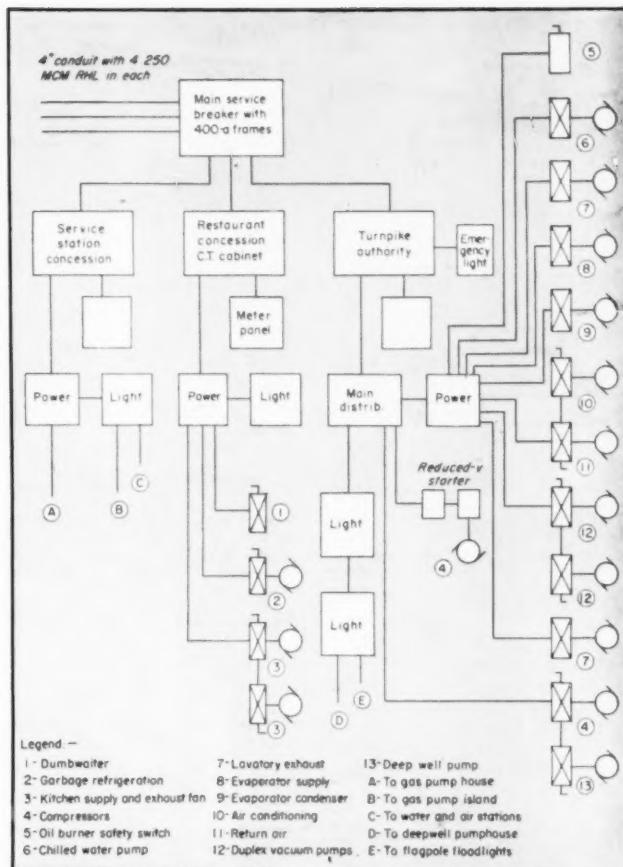
Substations, mounted on concrete pads and enclosed by barbed-top chain-link fences, are thoroughly grounded by 2/0 bare copper ground wire and 10-foot lengths of  $\frac{1}{2}$  inch copperweld ground rods.

#### Constant-Current Series Circuits

Exterior lighting at interchanges, toll plazas and service areas is by series circuits, fed by constant current transformers located at these substations. Series system components include high voltage fused cutouts, 7.5 amp constant-current transformers (varying in capacity from 15 to 30 kw depending on loop scope), service switches, sectionalizing equipment, required potheads, double-pole safety switches, concrete junction boxes and light-standard boxes, underground power conductors, ground conductors and rods, standards, luminaires and 120-volt ac time switches. While time switches are normally operated by astronomical dials, they can also be operated by manual controls should local atmospheric conditions warrant.

Underground loops consist of single-conductor No. 8 soft copper cables with 7500 volt ozone-resistant insulation, rubber filled taping and neoprene jackets, run in either asbestos cement or galvanized wrought iron conduit. Leads from isolating transformers to highway luminaires are 7-strand 600-volt cables. Splices are accessibly located in pole bases with joints saturated in solder and insulated with lapped rubber and electrical tapes. Taps and terminals are by positive-clamp connection devices protected by weatherproof fittings.

Metal conduit boxes, standards, electrical equipment, supporting structures



**TYPICAL SERVICE AREA**, combining facilities for food and fuel, has a 120-hp power load and 65-kw lighting load. Integral substation delivers 120/208-volt current to distribution centers through three 400-amp breakers.

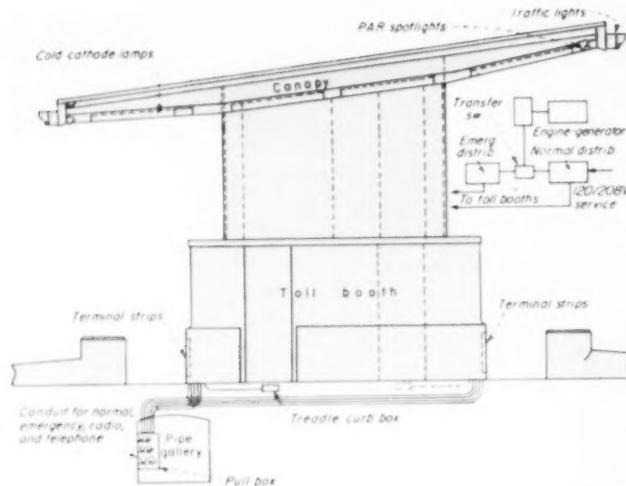
and metal guards are all grounded via No. 8 AWG solid bare tinned copper ground conductors run in the same conduits that carry the series lighting circuits. Ground conductors are connected to driven ground rods located at each lighting standard. Each standard is plainly identified by number and circuit loop section letter stencilled near its base for fast maintenance reference.

#### Color-Corrected Lighting

While it is unusual to describe a utilitarian exterior lighting installation as glamorous, this adjective can be used advisedly in a discussion of the flattering color-corrected fluorescent-mercury lamps installed around the administration building and at service areas, lunch rooms and filling stations along the Turnpike. Recently

developed by Westinghouse, this lamp constitutes a basic new light source, with a special phosphor coating fluorescing red at maximum efficiency in an isothermal-shaped bulb to balance the normal mercury vapor spectrum. The result is a golden-white light, considerably warmer than conventional mercury. Designated as the J-H1, the color-corrected lamp is a 400-watt, 20,000-lumen mogulbase unit operating at 135 volts and 3.2 amps. The lamp combines high output with high efficiency and long life, producing 20% more output than the A-H1. New also are the luminaires, for a football shaped overhanging unit was designed to house the isothermal-shaped bulb.

At traffic interchanges and toll plazas, standard mercury lamps are installed, mounted 30 feet above roadbeds either on steel or round standards hav-



**PIPE GALLERY** runs beneath roadbed, carrying wiring from utility buildings to booths for normal and emergency power and lighting, radio, telephone and other utility services. Treadle recorders and radio equipment are adjacently housed.

ing either 6- or 15-foot braced mounting brackets. Luminaires are grounded through the standards.

The glass-enclosed stone-faced toll booths, protected by sloping canopies, are highlighted by series of 150-watt PAR lamps installed along the canopies' inner edges, while red and green traffic lights mounted along the outer edges control the flow of vehicles through the various toll lanes. Vehicles are highlighted by cold cathode units located above each toll lane and extending in the direction of traffic.

Between interchanges and toll plazas the Turnpike is not illuminated by pole-mounted luminaires, yet the lanes are clearly defined by luminous reflectorized striping and special button reflectors.

Traffic signs, both standard and special, give ample notification to motorists concerning connections with intersecting highways. Signs are illuminated, reflectorized and/or floodlighted. Complete floodlight installations include transformers, junction boxes, cutouts, conduit fittings, conduit, structural steel, concrete supports, wiring and necessary controls.

Within the various highway structures, lighting includes fluorescent and incandescent sources; direct, indirect and combinations thereof; recessed, surface mounted and suspended. Fixtures in the many buildings include RLM domes, vaporproof incandescents, louvered downlights, suspended indirects, ceiling-mounted single-pin 2-

lamp fluorescent units having Albalite glass sides and louvered bottoms, ventilated opal glass ceiling bands, and concentric ring indirect stem-mounted luminaires.

Outside the buildings, floodlights have wide-spread steel-aluminum housings and hard-glass lamps mounted at 25-foot heights, while 2-circuit cartridge-fused cutouts are incorporated in pole bases. Also located in these areas are weatherproof copper-aluminum and sanded-glass general units, and standard gasoline pump floodlights with 12-foot mountings.

#### Radio Communications

The Turnpike also claims the most modern highway communications system in the country, with seven microwave towers insuring continuous contact with police cars, maintenance trucks, toll gates and administrative stations in all kinds of weather without requiring overhead pole-and-wire or underground cable lines. Operating at 960-megacycle, the installation provides a voice channel for monitoring the entire system, another for dial-phone administrative calls, two channels for state police and maintenance vehicles equipped with 2-way radio equipment, and one party-line teletype. In addition, five VHF base stations provide secondary 2-way radio coverage for police and maintenance cars.

Created jointly by RCA and the Paul Godley Company, and installed



**TOLL BOOTHS** at traffic interchanges are highlighted by series of spotlamps located along inner edges of canopies.

by the RCA Service Company, the system utilizes unique VHF directional antennas to maintain strong signals along the highway right-of-way while minimizing interference with adjacent community reception and transmission. Where signals overlap, mobile units can maintain clear, uncontested reception by selectively excluding the weaker signal and using only the stronger beam.

When message capacity must be increased, the system can be divided into 2, 3 or 4 sections through switching arrangements at the administration building. By this arrangement, any region having serious traffic congestion can be isolated from the rest of the network, so that the stepped-up volume of local messages will not tie up the entire system. Monitoring of these local messages continues from headquarters, however, and the system can again be unified by a throw of the switch when conditions warrant.

Towers have heights up to 150 feet and all microwave relay equipment is RCA's latest type CW-5B 960-mc. Base stations employ 60-watt radio transmitter-receiver units; maintenance and toll buildings have 15-watt fixed-station transmitters, and more than 50 police and maintenance vehicles are equipped with 15-watt Carfone transceivers. With this flexible, dependable system, constant contact between fixed and mobile units guarantees efficient traffic control, accident handling and road maintenance.

## Manufacturers of Major Items of Equipment

Series lighting luminaires, transformers and mat equipment, panels and switchgear	—Westinghouse Electric Corp.
Interior lighting fixtures	—Wheeler Reflector Co. Fullerton Manufacturing Co. Benjamin Electric Manufacturing Co. Eastern Fixture Co.
Fuel island lighting standards	—Revere Electric Manufacturing Co.
Highway lighting standards	—Phaff & Kendall
Conduit	—Triangle Conduit and Cable Co.
Transite ducts	—Johns Manville
Underground cable	—United States Rubber Co.
Building wire	—General Cable Corp.
Wiring devices	—Arrow-Hart & Hegeman Electric Co.
Concrete pull boxes and standard bases	—Roson Construction Co.



Cold cathode lamps highlight each lane. Brick utility buildings adjacent to booths contain standy engine-generators.

The physical extent of the Turnpike created unusual problems of supervision, trade coordination, material supply, personnel transportation and communication. To a large degree the problem was solved by dividing the Turnpike into seven sections, each in charge of separate engineering firms. As a result, 76 major contracts and 34 minor ones were awarded. The one exception to this subdivision of responsibility was the electrical installation for, although separate bids were taken for the seven portions of the work, all seven contracts were won by the same contracting company.

Supply was aggravated by material shortages created by national military and stockpiling programs. Fortunately, however, most of the 188,000 tons of fabricated steel had been ordered prior to governmental limitation orders and it was generally available when required for piling, reinforcing, support and ornamentation of the 263 concrete and steel structures; the largest and final structure to be completed being the 7100-foot Passaic River Bridge.

Operating 18 hours a day, fleets of trucks moved 51 million cubic yards of fill to create roadbeds across marshes and low areas, and 188,000 cu. yds. of rock were blasted from the intervening hills. Of related interest is the extensive use of sand drains, created by driving 14- and 20-inch tubes through and alongside the earth embankments, filling these tubes with

(Continued on page 183)



**WROUGHT IRON CONDUIT**—over 120,000 feet of it—was delivered to toll plazas, service areas and substations for underground distribution of power. Threads were protected by tapered composition cuffs.



**SAFETY PRECAUTIONS** include this tubular aluminum working platform which was lowered to hook over bridge railings while electricians established pole-mounted luminaires. Assembly was designed by Lighting Electric.

## ESSENTIALITY OF STEEL CLAD SYSTEMS OF WIRING

It is apparent that overall defense policy of the nation is pointed towards a continued emergency. This emergency can take any one of the following three forms:

- A. Status quo on world fronts with Korea either continuing as it is or being settled in an armed truce.
- Continuation of cold war with its threats, tensions and dangers.
- B. An expanded cold war or little hot wars confined to definite areas greatly separated to extend the U. S. and Allied logistics to the maximum.
- C. All out war between the U. S. and its allies and the U. S. S. R. and its satellites.

Any one of these three forms will mean tremendous production required for weapons, ships, tanks, transportation, military installation, and plants for the maintenance of these programs, etc. This means building of plants, Army, Air and Navy Bases, shipyards, and housing for the workers. At no point is the defense program separated from building and building maintenance. The defense program, at its most conservative estimate, indicates that building must continue at the highest rate the U. S. has ever experienced.

It is basic to note that it takes material to get more material to meet the needs of defense. The steel expansion program is necessary for defense; it is estimated to bring an additional 12,000,000 tons per year beginning approximately 1953. To expand to this additional production, approximately 4,000,000 tons of steel will be used. To expand in copper or aluminum it will be necessary to build large plants. These plants will take critical materials. In all production programs related to defense, labor saving will be paramount. Automatic machines and their safety controls will be more necessary than ever. They will require great amounts of additional wiring.

It would be extravagant and impractical for such an important building program to be attempted on anything but a permanent basis. We will not need additional steel

and additional housing for the steel workers just for today and tomorrow. We will need them and other facilities for years to come. We will need atomic plants, weapons plants, plane fields, and Army camps on a long range program to gain national security. All materials must be the best—the installations must be permanent.

With our sights raised high for quantity and quality production, we must consider one of the most basic components of construction—electricity. Electricity is the nerve center of the factory, tank, ship, plane, home, and mine. It is also the nerve center of production and distribution facilities of the petroleum, chemical, gas, and many other industries which relate directly or indirectly to the national economy or to the defense effort. We cannot skimp in the quantity or quality of the defense effort. We cannot skimp as regards the reliability or performance of the electrical distribution systems so vital to the defense program.

If our installations are to be of a permanent nature, our electrical systems must be of the same quality. 'For want of a nail the shoe was lost', is an old quotation which relates to this situation. Long lasting, safe electrical systems should be installed in steel raceways. The U. S. Bureau of Standards, local, and national electrical codes support this statement. Any qualified technical group accepts this axiom as a basic and elementary fact.

Steel raceways afford protection and security of installation which no other system can offer.

- A. Safety against the hazard of shock is provided by reason that steel raceways are completely grounded systems.
- B. Steel raceways protect from external mechanical damage and prevent time-consuming breakdowns.
- C. Steel raceways provide protection against moisture which no other system can provide.
- D. Rigid conduit protects against corona cutting and prevents breakdowns on high voltage work.

# Steel Clad Wiring Systems Are

By Berlon C. Cooper

**The Electrical Conduit Industry Advisory Committee reports on the essentiality of steel raceway systems to Charles E. Wilson, ODM Chief, and NPA officials.**

**T**HE Electrical Conduit Industry Advisory Committee is a representative group of individuals from this industry. It was formed by the National Production Authority, Office of Industry Advisory Committees, for the purpose of furnishing advice and information to NPA on matters within that industry affecting the national defense effort. NPA calls a meeting of this Committee when there are problems which either NPA or the Committee feels are sufficiently urgent to warrant members being called to Washington. At meetings no actions are taken or decisions made, since they are solely for advisory purposes.

The last two meetings of the Electrical Conduit IAC group were held October 11, 1951 and November 14, 1951. At the October meeting, Committee members were asked to prepare a report covering important points on the essentiality of electrical steel conduits. Three members prepared such reports, which were read at the November meeting.

Committee members urged that these three reports be summarized by a subcommittee, and that the summary report be included as an Appendix to the minutes of the meeting. It was further recommended by the Committee that this report be suitably bound

- E. Steel raceways provide a pull in and pull out system whereby changes required in production can be made electrically. An electrical system can be changed very quickly with a pull-in, pull-out system. Other systems require many extra hours of labor. Pull-in, pull-out systems provide for quicker repairs.
- F. Where engineers and specifying organizations write steel raceways into the code for safety it is necessary to maintain these codes. Any relaxation of the Steel Raceway Code will create fire hazards and other safety hazards. More steel and other critical materials are wasted in the loss of buildings due to not observing normal code practices than are used in the correct initial installation of protective steel raceways.
- G. The limited space factor makes it impractical to install power and control wires without the use of metal raceways.
- H. Installations unprotected by steel raceways can be tampered with and are conveniently subject to incorrect wiring practices which become a liability to production and safety.

Following are some types of installations for which there is no substitute for steel raceways:

- A. Atomic energy plants.
- B. Arsenals.
- C. Salt and chemical plants.
- D. Oil, gas, and chemical production and distribution facilities.
- E. Meat packing plants.
- F. Telephone company specifications.
- G. Grain elevators.
- H. Photographic plants.
- I. Pharmaceutical plants—blood plasma and medicine.

Other materials cannot satisfy requirements of the above listed locations. Substitute materials may be adequate for the short haul in some cases, but the defense policy of the nation should not be short haul protection.

The demand for steel raceways, and a high percentage of it CMP rated, far exceeds production, or even the potential maximum production of the industry. Although many producers have entered the field, and several exist-

ing companies are expanding their facilities, the essential demand will far exceed the production even if more steel allocations are made available.

Today the steel raceway mills are not producing to their full capacity due to the emphasis placed on other steel items. CMP restrictions have limited amounts of steel raceways that manufacturers can produce even though they have additional capacity.

It is recommended that the Government look with favor upon any increased steel raceway capacity which can be accomplished by industry and that NPA aid industry in every way possible to accomplish this end. It is recommended that NPA give steel raceways a high priority in the defense effort when considering any steel allocations. The Electrical Equipment requirements through 1953 as published by the National Electrical Manufacturers Association correctly points out that the national objectives for the next two years are to be:

- A. A 10% to 12% increase in Gross National Production.
- B. A 12% to 15% increase in industrial production.
- C. An increase of 40% in the electric generating capacity.

This analysis establishes the essentiality of steel raceway systems in the defense program. It is obvious that the fittings which are an integral part of the system are as necessary as the raceway itself.

- A. Conduit fittings and all types of cast outlets.
- B. Outlet boxes and switch boxes.
- C. EMT and flexible steel conduit couplings, connectors and fittings.
- D. Surface raceway fittings.
- E. Underfloor duct fittings.

Since the essentiality of the expanded electrical program has been approved, it seems obvious that raceways and fittings should be approved as essential, not only based upon today's possible production, but based upon increased production.

**Prepared and Submitted by**  
**Electrical Conduit Industry Advisory Committee**  
**to the National Production Authority**

# Essential...

and illustrated, and that copies be submitted to Charles E. Wilson, Chief, Office of Defense Mobilization, and to Manly Fleischmann, Administrator, Defense Production Administration and NPA. The text of this report is published above, under the title "Essentiality of Steel Clad Systems of Wiring".

This report has also been sent to all manufacturers of steel clad wiring systems—conduit, EMT, raceways, outlet and switch boxes, fittings, etc.—and to distributors, electrical contractors, architects and engineers. It is the hope of the conduit producers that these other groups—the sellers, the instal-



... for Atomic Energy Plants

# STEEL CLAD WIRING SYSTEMS ARE ESSENTIAL . . .

lers, the specifiers—may make similar recommendations to NPA through their own Industry Advisory Committee, or trade associations.

Since the Electrical Conduit IAC submitted its essentiality report, further backing of the Committee's recommendation has developed. This backing comes from DPA-boss Fleischmann's special four-man committee, appointed by him last fall to study the nation's electric power expansion program. This committee's report, completed during the first week in January, in essence states that a 40% expansion of U. S. power capacity by 1954 is needed, probably will not be enough, and isn't too much for the nation's economy. It also states that the program should be further enlarged if mobilization is to continue to speed up.

Fleischmann's four-man Committee report made three specific points: 1) from now on, the power expansion program must get full material requirements—on time; 2) inland utilities should be given priority over coastal utilities (to meet power requirements of defense industry which is moving inland from the Atlantic and Pacific coasts); and 3) local and regional power entitlements will increase (demand for power—now straining the capacity, will increase at a faster rate than new capacity can be added).

This electric power expansion program report inherently proves the point that *use of electric power* is ever increasing. A major factor in America's outstanding record of stupendous economic growth over the past 100

years is its swing from animal power and manpower to machine power—*mechanization*. Mechanization, now more than ever, is the best answer to material and manpower shortages. And mechanization means more power, more *electric power*.

## More Wiring Needed

Increased mechanization of industry, key to increased production, and new uses and applications for electric power in industry, in homes, and on the farms, means more electric wiring systems. It is urgently essential that these wiring systems be absolutely reliable and safe. Steel clad systems of wiring provide this reliability and safety better and more economically than any other system, for the reasons outlined in the conduit essentiality report of the Electrical Conduit Industry Advisory Committee.

Two results are attained by this essentiality report on steel clad wiring systems: 1) it provides needed factual information and data on electrical conduits and fittings for NPA, and establishes the need for increased metals allocations to conduit producers; 2) it focuses the attention of specifiers, sellers, installers, and users on the reasons for, and benefits of, conduit in wiring systems. The first objective was planned; the second is incidental.

Like many other industries, the electrical conduit industry as an industry has not in the past promoted its products as effectively as it might have done to its own advantage. This fact has been pointed up sharply to the members of the Electrical Conduit

IAC Committee in its effort to justify with NPA officials their need for a greater allocation of materials. Thus this Committee's report on "Essentiality of Steel Clad Systems of Wiring" provides a sound foundation for effective product promotion—for producers, for distributors, and for installers or electrical contractors. It provides an outline for a continuing promotion of the benefits and of the qualities of the products. These benefits and qualities are even more important now in the defense program than in peace time.

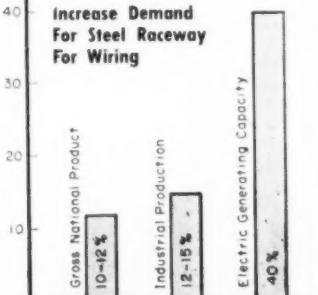
L. Alan Sharp of NPA's Electrical Equipment Division, Washington 25, D. C., is Government Presiding Officer for the Electrical Conduit Industry Advisory Committee meetings. Members of this Committee, selected and appointed by NPA, are: Robert Hula, Clayton Mark and Co., Evanston, Ill.; H. B. Tompkins, Clifton Conduit Co., Baltimore, Md.; Robert Mellroy, Enamelled Metals Co., Elma, Penna.; D. J. Murray, General Electric Co., Bridgeport, Conn.; R. C. Bennett, Jr., National Electric Products Corp., Pittsburgh, Penna.; C. J. Ramsburg, Jr., National Supply Co., Pittsburgh, Penna.; Edward H. Hakim, Nikoh Tube Co., Chicago, Ill.; H. R. Coward, Republic Steel Corp., Cleveland, Ohio; O. J. Lewis, Rome Cable Corp., Rome, N. Y.; J. C. Siegle, Youngstown Sheet and Tube Co., Youngstown, Ohio; J. H. Collier, Steelclad Co., Youngstown, Ohio; G. V. McKay, Triangle Conduit and Cable Co., New Brunswick, N. J.; and A. M. Callanan, Walker Bros., Conshohocken, Penna.

## STEEL RACEWAY SYSTEMS AND COMPONENTS

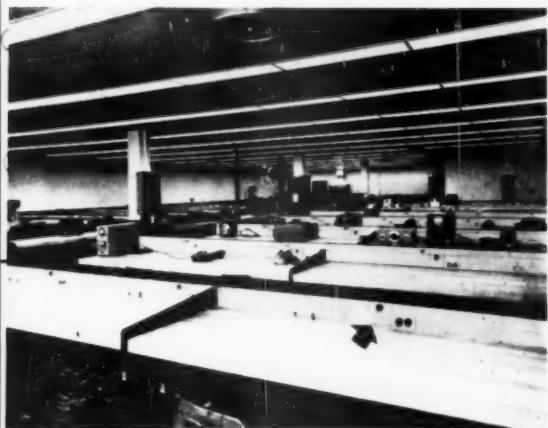
(Used in Steel Clad Wiring Systems)

- Rigid steel conduit.
- Electrical metallic tubing (lightweight steel conduit).
- Flexible steel conduit.
- Steel underfloorduct.
- Steel surface raceways.
- Conduit fittings and all types of cast outlets.
- Outlet boxes and switch boxes.
- EMT and flexible steel conduit couplings, connectors and fittings.

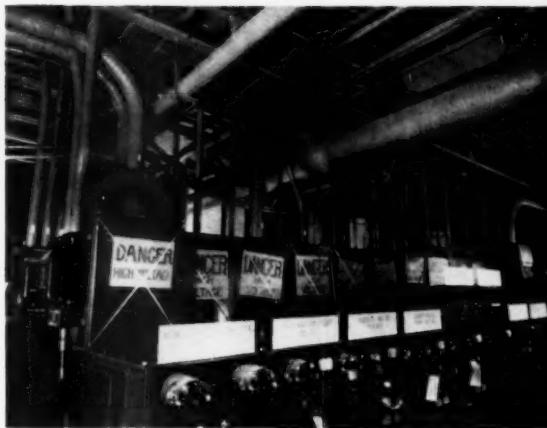
## GOVERNMENT PLANNING OBJECTIVES THROUGH 1953



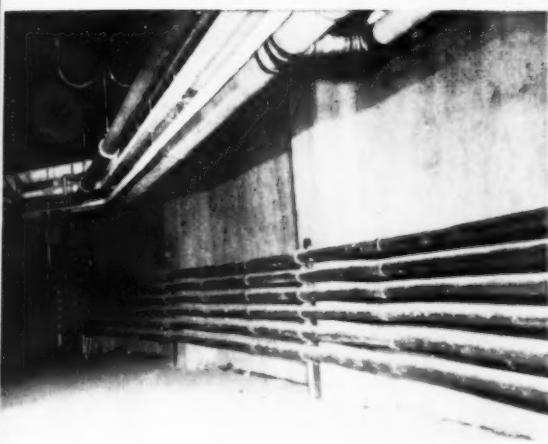
... for Defense Production Assembly Lines



... for Chemical and Petroleum Plants



... for Airports, Electric Utility Plants



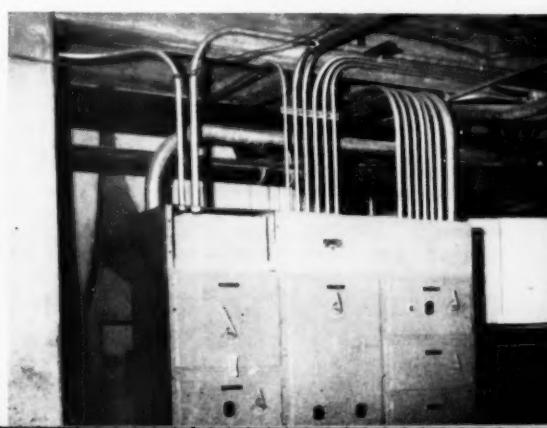
... for Military and Naval Installations



... for Steel Mills, Aluminum Plants



... for Hospitals, Schools, Office Buildings



**FIG. 1** —A separate file form for each machine should provide the machine's identification, location and name-plate data.

PLEASE PRINT IN INK		FILE #
HP	MAKE	MOTOR OR CONTROL DATA FILE
LOCATION #	OWNER	
D.C. OR A.C.	FRAME	
VOLTS	TYPE	
AMPS	MODEL	
RPM	SERIAL #	
BULLETIN #	WINDING	
DRIVING	DRAWING #	
DATE	PULLEY OR GEAR SIZE	
TAKEN BY	CONDITION	
REMARKS		

By **Walter J. Prise**,

Chief Engineer  
The Maintenance Company, Inc.,  
New York, N. Y.

# MAINTENANCE RECORDS

## How to set up an easy-to-handle system of records for smooth operation of a motor maintenance program.

**S**ETTING up maintenance records is just like taking in boarders—you only want the ones that will pay for their keep. If a record doesn't payoff in increased efficiency, it simply isn't worth keeping. Every record a maintenance department keeps must contribute to a clear overall picture of maintenance operations.

For maximum effectiveness, however, it is necessary to set up first a records handling system which is simple, logical and fast. A well organized filing arrangement must be established, using standard size forms for keeping the various records. To facilitate uniform bookkeeping, the forms should be suited to the company's general system of records. And the size of the forms must accommodate flexible filing—in-terschanging and expansion of filing cabinets. Ease of handling and quick availability must, of course, be a prime consideration.

As an aid to the successful function of this form and filing system, maintenance personnel should be made "record-conscious". They should be instructed in the operation of the system, its meaning and its value. Definite handling patterns for using the forms

should also be clearly explained. And great care must be taken in making any changes in the system, once it is in operation. Any change should be made gradually and should be called to the attention of all concerned.

Perhaps the most impressive device for educating personnel in the significance of a record keeping system is a flow chart. When supplemented by thorough instruction, this visual aid quickly establishes a record-handling facility among new workers.

Now to get down to the real problem—records worth keeping, those boarders that will pay for their keep. In selecting the information which must be recorded, the word "essential" is the key. Keep all essential information and only essential information. Record this information on the forms neatly and orderly, so the forms are easy to read and understand. Combine as much information as possible on each form. When the system is in operation, changes in specific maintenance procedures should be recorded on these forms with sufficient explanation of the change. Remember, however, recording only essential data saves time and effort.

Although other records may be kept by a maintenance department, the following list of necessary maintenance records represents only the requirements of job performance.

**1.** A record of every machine covered by the maintenance program (Fig. 1) should give the machine's location and its identification. A separate form for each machine, this record should contain the serial number, operating data and any important remarks.

**2.** A performance record for each machine (Fig. 2) should list all repair work done on the machine, along with a general case history of the machine's performance. This record provides valuable information for periodic analysis of the operation of the maintenance program and serves as a guide to its improvement. Time needed for replacement of each machine, possible obsolescence of the machine and a replacement schedule can also be determined from this record. Often, comparison of the performance records of different machines indicates the type of machine best suited to a particular application.

**3.** Maintenance recommendations for each machine (Fig. 3) should be out-

**INSTRUCTIONS**

**FIG. 2**—A performance record should list the repair work done on the machine, along with a brief performance history (above).

**FIG. 3**—Recommendations on the maintenance of each piece of equipment should be outlined on the back of the performance record form, above right.

**FIG. 4**—Record forms should be set up for each spare machine, providing quick location of each unit for replacement duty. (right)

H.P.	MAKE
STOCK #	SHELF #
PHASE	
VOLTS	
AMPS	
RPM	
FRAME	
TYPE	
SERIAL #	
WINDING	
REMARKS	

MOTOR STOCK CARD #1

lined on the back of the performance record form, below the instructions for the use of the form. The results of studies performed by qualified engineering personnel and outside engineering experts should be listed. This information must be easily understood by mechanics doing upkeep and maintenance work.

4. A record of expenses on each and every machine supplements the information contained in performance records.

**5.** A personnel performance record on each man engaged in maintenance work helps to evaluate effort and ability and assures deserved recognition and promotion.

6. A personnel dispatching record shows the whereabouts of maintenance men at any time.

7. A record of maintenance and repair jobs scheduled to be performed will help in the evaluation of needed man hours, so additional men can be obtained and assigned in advance. It also indicates materials to be purchased in advance, saving time later.

**8.** A record of materials and parts used provides help in planning purchases and can lead to standardization.

in purchasing and savings through volume buying.

9. A stock list of all items used in maintenance work helps in locating parts and expedites replacement.

**10.** Inventory cards facilitate a continuing check on the supply of maintenance items and can easily be combined with the maintenance stock list.

**11.** A list of spare machines should be set up in such a way that each spare unit can be located quickly for replacement duty. This record points up the need for particular types of spare equipment and indicates the spare units which are not in demand and might be sold or replaced with units which are in great demand. For easier identification, two forms can be used: a white form for dc motors; a colored one for ac machines. (Fig. 4)

**12.** A record of the expenses of the maintenance department should clearly show the allocations to the various categories of operation. This record indicates the distributions of cost and will help in preparing allocations for the annual budget.

**13.** A tabulation of all work performed by outside individuals or outside repair shops, with the expenses

incurred, is necessary in determining the overall cost of operations.

**14.** Any transportation costs should be recorded.

**15.** A record of the issuance and use of tools and instruments will assure control of their good condition.

**16.** Special records of technical and semi-technical information should contain winding data, wiring diagrams of motors and control equipment, tabulated performance data, characteristics curves, instruction books and any other pertinent information.

Many of these records can and should be combined to simplify filing and handling. In any maintenance department, this can be accomplished by careful analysis of maintenance operations in relation to the company's general modus operandi.

As soon as a record system has been put into effect, its value depends on constant reappraisal of all functions. The forms and filing method must keep pace with any growth or change in maintenance requirements, and records must be checked for essential content. To put it simply, the record system with best maintained efficiency—best maintains efficiency.

The Nine Major Market Areas and Their Share in 1951 Appliance Sales

	Residential & Rural Electric Customers Jan. 1, 1952	Shipments by Percent of U. S. Total							
		% of U. S. Total	Washers (8 mos.)	Ironers (8 mos.)	Dryers (8 mos.)	Refrigerators (9 mos.)	Ranges (9 mos.)	Water Heaters (9 mos.)	Freezers (9 mos.)
New England	2,766,400	6.75	6.45%	6.46%	4.07%	5.70%	6.99%	5.47%	4.00%
Mid. Atlantic	8,444,260	20.61	22.60	23.44	19.53	23.49	15.31	15.00	13.84
East North Central	8,639,610	21.09	21.73	25.80	36.87	19.39	19.93	22.46	21.98
West North Central	3,963,350	9.67	9.21	10.58	11.09	9.46	8.63	11.59	15.92
South Atlantic	5,196,610	12.69	11.72	8.32	5.34	14.10	21.33	25.55	12.11
East South Central	2,548,440	6.21	5.24	2.26	1.96	6.17	9.53	6.96	5.82
West South Central	3,600,800	8.79	7.70	5.75	2.99	9.04	3.61	2.10	12.22
Mountain	1,354,090	3.31	3.31	4.09	2.60	3.06	4.09	3.81	5.10
Pacific	4,453,620	10.88	12.04	13.30	15.55	9.59	10.58	7.06	9.01
United States	40,967,180	100%	100%	100%	100%	100%	100%	100%	100%

# Customer Shortage Hurts Appliance Sales

By R. W. Armstrong

Managing Editor, "Electrical Merchandising"

**Clothes dryers, dishwashers, freezers and air conditioners make big gains in 1951, but staple majors slide as much as 34 percent. 1952 looks tough and uncertain**

As expected, 1951 sales of appliances, radio and TV did not set any records. But the reason was a shortage of customers, not the predicted shortage of merchandise. For many retailers, the results were painful. Sales zoomed into the first three months of the year at 1950's high levels—then in April they smashed against a sudden consumer indifference. Inventories were high, higher than they had ever been in industry history. The usual spring pickup failed to materialize and overhead kept right on piling up. The rest of the year was a long and painful effort to move enough merchandise at any price sufficient to keep the doors open.

Most retailers had put all their eggs in the refrigeration-TV basket and these were the two appliances that suffered the most. According to *Electrical Merchandising's* annual January statistical and market planning issue, refrigerator sales, with a volume

of 4,075,000 units, were off 34.3% from 1950. Television, the postwar boom child, was off 31.7% with a total of 5,100,000 units.

Among the old-line appliances requiring special wiring, ranges and water heaters took the worst licking. Ranges, with 1,400,000 units, were off 23.5% and water heaters, which even in 1950 failed to approach the all-time record of 1,100,000 units set in 1947, were off 14.6% with a total sale of 845,000 units.

Other standbys of the retailer were hit, too. Vacuum cleaners, with 2,700,000 units, were off 23.5%; standard size electric washers (3,433,000) were off 19.7% in units, but because of the increasing acceptance of automatic models (which far outsold conventional types dollarwise and nearly matched them in units) dollar volume was off only 7.9%. Home radios dropped 19.3% to 6,600,000 units. Ironers suffered a 31.6% decline

to 280,000 units. Water systems fell off 15% to 625,000 units.

For most of the older, well-established appliances, the story was one of falling sales. But some of the post-war babies made substantial, even startling gains. Freezers, for example, gained 18% to 1,050,000 units. Dryers jumped 55.4% to 495,000. The 260,000 dishwashers sold represented a gain of 13% and food waste disposers climbed 4.7% to 335,000 units. Room air conditioners, looked upon by many retailers as "summer television", showed new promise with a 28.7% gain to 251,000 units. Dehumidifiers, one of the newest appliances, gained 22% to 55,000 units. And improvements were made by some of the small appliances, including roasters, steam irons, deep fat fryers, blenders, electric bed coverings, and broilers.

## New Appliances

Unfortunately for the average retailer, the new appliances, despite their ready acceptance, represented too small a total volume to compensate for the difficulties of the staple items. And as problems grew for refrigerators, TV and ranges, the less time and effort the dealer was able to put in on the pioneering appliances. By the end of the year he still had a substantial inventory, (although much re-

**The Appliance Sales Story, 1951 and 1950**

Product	1951		1950		% Change	
	Number Sold	Retail Value	Number Sold	Retail Value	Units	Value
Air conditioners, room	251,000	\$91,615,000	195,000	\$72,150,000	+28.7	+27.0
Bed coverings	745,000	31,662,500	685,000	27,057,500	+8.8	+17.0
Cleaners, vacuum (floor)	2,700,000	231,525,000	3,529,400	280,305,000	-23.5	-17.4
Dishwashers	260,000	78,000,000	230,000	66,700,000	+13.0	+16.9
Disposers	335,000	45,925,000	320,000	43,200,000	+4.7	+4.7
Dryers, clothes (elec. & gas)	495,000	118,162,300	318,500	70,449,400	+55.4	+67.7
Fans						
Attic	90,000	12,325,000	95,000	12,302,500	-5.3	+0.2
Vent. & window	460,000	16,790,000	495,000	17,745,800	-7.1	-5.4
Freezers, home	1,050,000	378,000,000	890,000	289,250,000	+18.0	+30.7
Heaters, space (elec.)	975,000	14,576,200	1,115,000	15,364,700	-12.6	-5.1
Ironers	280,000	42,830,000	409,200	59,465,900	-31.6	-28.0
Radios, Home	6,600,000	229,350,000	8,174,600	382,653,000	-19.3	-40.1
Ranges	1,400,000	343,000,000	1,830,000	424,623,000	-23.5	-19.2
Refrigerators	4,075,000	1,120,625,000	6,200,000	1,602,266,000	-34.3	-30.1
Washers, electric	3,433,000	722,425,000	4,272,580	784,563,600	-9.7	-7.9
Water heaters, storage	845,000	114,075,000	990,000	131,175,000	-14.6	-13.0
Television	5,100,000	1,570,800,000	7,463,800	2,235,408,000	-31.7	-29.7
Water systems	625,000	96,875,000	735,000	113,925,000	-15.0	-15.0

duced from the highs of midsummer), his credit was often over-extended, Christmas had not brought any miraculous improvement, and, as he entered the first three months of 1952, traditionally the worst sales quarter of any year, customers were still all too few.

A good deal of his 1951 difficulties were caused by the inevitable reaction to the overbuying of the 1950 war scare. Some of them he owed to the high rate of savings; people put more money away than in any year since the war. And some, of course, he owed to his own reluctance to reverse the post-war procedure of waiting for customers to come to him. It took more than cut prices and promotional advertising to sell refrigerators in a market that by the end of the year was 86.7% saturated, or TV sets in the areas where TV could be sold and where acceptance reached 54.8%. Fortunately, the nation's homebuilding program continued at a high level, giving dealers markets for the basic appliances and which, by the year's end, combined with modernization projects, gave merchants a total of 40,967,180 wired homes, 1,923,000 more than in January, 1951.

According to *Electrical Merchandising*, these 40,967,180 customers were divided into 27,536,668 residential and rural, 8,830,512 rural non-

farm, and 4,600,000 farm. More of these, 8,639,610, were located in the East North Central states (Ohio, Ind., Ill., Mich., Wis.) than in any other area and the region continued to be, overall, the biggest buying territory of the nation, accounting for 21.73% of washer shipments, 25.8% of ironers, 36.87% of dryers, 19.39% of refrigerators, 19.93% of ranges, 22.46% of water heaters, and 21.98% of freezers. The Middle Atlantic States (N.Y., N.J., Pa.) were first in refrigerators (23.49%) and slightly ahead in washers (22.6%). The South Atlantic region (Del., Md., D.C., Va., W. Va., N.C., S.C., Fla., Ga.) with only 5,196,610 customers, was first in water heater (25.55%) and range (21.33%) shipments.

#### Fewer Dealers

From figures submitted to *Electrical Merchandising* by 205 power companies serving 74% of the nation's wired homes, it is apparent that, despite the enlarged market, there were less dealers to serve it than in 1950. The utilities found a total of 67,110, a drop of 4% from the 69,682 reported at the end of 1950. This dealer mortality was not reflected in the plans of the power companies to merchandise or not merchandise, apparently, as only 88 of them (43%) said that they would

actively sell appliances, exactly the same number that had similar plans in 1951. This reluctance of the utilities to sell is particularly noteworthy in view of the fact that some areas of the country suffered substantial dealer losses. On the other hand, some regions reported sizable increases: East North Central, 16.85%; West North Central, 25.12%; South Atlantic, 5.04%; and East South Central, 11.15%.

Against the background of consumer apathy, possible shortages and currently heavy inventories, the average retailer couldn't be strongly optimistic about 1952 sales prospects. Barring more war and/or a consumer buying rush, he is not likely to see 1950's sales records broken this year. But he has the small consolation that without a buying rush and with shortages he may have enough stocks to at least get him through the first half of the year. Manufacturers are going ahead with production plans—as indeed they must—and are gearing themselves to a year in which they must sell. Dealers are in the same tippy boat. And for those of them who cut costs diligently and put sales effort behind the appliances which best fit their own markets, 1952 should be a year in which black ink outweighs red.

Why do jobs lose money on the TRIM? That question has been asked repeatedly over the years. At a meeting of electrical contractors in Houston in 1949, the question was advanced again. It seemed to be the general consensus that jobs often progressed favorably through the roughing (installing of conduit, boxes, and associated materials) stages and then began to "slump off."

The term "trim" is used loosely in the electrical contracting business and the work it embraces is not generally defined. For our purpose, let us say that it includes all work that comes after roughing-in and pulling of feeders has been completed. Specifically, it includes the installation of branch circuit wire, panels, wall switches, convenience outlets, signal equipment, motors, and other operating equipment plus testing of same.

On single family and small multi-unit residential buildings, wire pulling of all kinds is classed as trim work. Cable pulling is commonly considered trim work by contractors, but for our discussion we will omit pulling of feeder and service cables.

The subject of "trim labor" is often queried but seldom studied in detail. Delving into it can prove enlightening.

A study of several projects reported as having had excessive costs for the trim labor revealed that very often one or more of the following conditions existed:

(1) Analysis of job progress had been faulty.

(2) The job had been poorly managed.

(3) Labor estimated for the trim work was not adequate.

(4) The mechanics had "let down" on the work.

Let us study each condition separately.

#### Faulty Analysis

It is common for electrical contractors to over-estimate the portion of a job that is completed. This is particularly true of roughing-in labor. The job is ready for cable pulling and setting panels. It is assumed, therefore, that the roughing-in labor is all completed. In reality there may be numerous costly odds and ends that have to be picked up. Besides, there is the pro-rata share of cleanup and shipping-out labor that should be charged to roughing-in. Cleaning cabinets and boxes, scattered piecing-out of conduits, removing conduit obstructions, installing box covers, and shipping-out are all items of cost which are frequently and incorrectly charged against trim labor. Such accounting reflects cost all out



**MANAGEMENT SHOULD PLAN** a job carefully before construction begins, set up a timetable for labor based on known and anticipated job conditions, then follow it as closely as is practicable.

## Watch Your TRIM Labor

of proportion to true values. Some figures will emphasize this.

On a hospital job, with which I am familiar, 70% of the labor was consumed for roughing-in and pulling of feeders; the remaining 30% was trim labor. On the basis of 100 hours, the corresponding divisions were 70 and 30 hours. If the roughing-in and cable work had been reported complete when it was only 85% done, there would have been 15% of same charged against the trim. This would be 15% of 70 hours or 10.5 hours. This is over 33% of the total time required for trim labor. Naturally the report on trim labor would have looked very bad if it had been burdened with an excess charge of over 30%.

Contractors might become cognizant, to some degree, of their mistaken appraisals if they followed jobs closely to completion. However, they are prone to slight the work as soon as it has passed the roughing-in stage. Both false appraisals and job neglect are problems for management.

Management plays an important part at every stage of a construction project. However the discussion will be confined to the trim portion. Work must be followed through to completion. The hours wasted at the finish of a job are just as valuable as those lost at the beginning. Every dollar added to the cost of the job makes two dollars difference in the showing on the books. It adds one to cost and takes one away from profit.

One of management's most costly mistakes is the failure to reduce crews before the jobs begin to drag. A project must be followed closely so that as soon as it passes the peak, removal of mechanics will be in step with the decline of work. On overmanned jobs the foreman cannot use his mechanics to the best advantage and they, in turn, slacken their pace. A surplus of men on a project often gives rise to false and detrimental rumors such as: "This is a cost plus job"; "We are way ahead on labor"; or "Men are scarce and the boss doesn't want to let us go."



**FOLLOW JOB PROGRESS** closely by making regular visits to the project and consulting with the construction superintendent. Adjust size of crew to fit the work at hand.

## An analysis of factors which cause electrical construction jobs to drag along during the finishing stages, plus some pertinent suggestions on how to eliminate this condition

By Ray Ashley

Research and Consulting Engineer  
Chicago, Illinois

There are times when contractors deliberately keep men on a job when not needed to hold them for future work. In such cases the current job should be honestly noted as carrying excess labor and not be considered a dragging contract.

Another management fault lies in having wrong men on the job for the trim or finishing work, but not on finishing up the job. To overcome this difficulty, some contractors have their mechanics divided into two groups: one group for roughing-in and the other for trim work. Shifting of crews is limited to large jobs.

The labor market and the volume of work put certain limitations on the contractor's flexibility in selecting men. This must be taken into account when the work is being estimated. The contractor has no right to complain about job progress just because he failed to estimate the work according to prevailing conditions.

There are two reasons why labor units used for trim work are fre-

quently too low. First, they are of the stop watch type. Second, upward adjustments of units to meet rising labor costs are centered on the roughing materials. The so-called "stop-watch" labor unit is obtained by spot checking job labor, is confined to concentrated portions of the work, and does not give a true picture of overall costs. No allowance is made for scattered portions of the work, and preparation and pick-up time are not accounted for.

In the event of a poor labor market, contractors try to adjust their labor units accordingly. Too often attention is concentrated on conduit, boxes, and large cables. Trim materials are overlooked. A similar faulty adjustment occurs when preparations are being made to figure complicated projects. The slow progress of sewage disposal plants, railroad stations, and similar complicated jobs is not limited to the roughing-in work; it prevails right up to the very end. Contractors are prone to overlook its impact on trim labor.

Estimators ignore the effect that wire size will have on the labor for installing wall switches, receptacles, and similar devices. They use units based on No. 14 wire, to figure work where the minimum size of wire is No. 12 or larger.

### Mechanics "Let-down"

Fatigue, apathy, and fear of being out of work, are among the principal reasons for mechanics "letting down" on the job. Fatigue may be from outside causes, but we will limit ourselves to the job causes. Too much pressure during the roughing-in stages of the job or long hours may tire men to a point where they cannot do their best. The trim portion of the work, being last, suffers most from the effects of overworked mechanics.

In electrical construction, as in all other lines of work, there are men who avoid doing more than they have to. The nature of such mechanics varies from apathetic to downright ornery. Many mechanics have a feeling, and some rightfully so, that their bosses are getting all they can out of them.

It isn't natural for a man to work himself out of a job. When men are being laid off instead of being transferred to other projects, those remaining are inclined to slow down. In the absence of close supervision, the impression may evolve that management wants the mechanics to mark time pending the opening up of another job.

Unless the labor market is so bad that the poorer mechanics must be used, management can forestall this situation.

### Psychological Conditions

Contractors are always anxious to see jobs completed at an early date. Because of this they are frequently prone to label as "dragging" a project which, in reality, is progressing normally. Also, there is an abundance of "wishful thinking" in the electrical construction fraternity. A venture moves along smoothly in the early stages and the contractor immediately decides that he is going to make a "killing." When things settle down and he realizes that the profit will not approach his expectations, he complains that the work dragged along in the trim stages.

Jobs naturally slow down in the finishing stages. It is not a case of a let-down; it is the effect of working against odds. Allowances must be made for this in the estimate. If management is functioning properly, there is no reason for jobs to lose money on the trim work.

Demand for greater seeing comfort in industrial lighting, plus introduction of fluorescent lamps, has stimulated reflector development. Use of newer reflector designs improves lighting, increases production economically.

CHART IV - COMPARATIVE LIGHTING COSTS  
(Based on Quality Lighting Systems for Comfortable Seeing, Louvered Type Fixtures with Uplight)

\$7435	\$19663	2/40 Commercial *
\$8842	\$22650	3/40 Industrial **
\$9528	\$23691	2/85 "
\$8820	\$24926	2/40 "
\$9530	\$26210	3/75 "
\$9204	\$26721	2/75 "
Annual Operating Costs		
Total Investment Costs		

- \* Commercial fixture — All metal baked with enameled Louvered shielding — (35°C-25°L) — 50% uplight
- \*\* Industrial fixture — Porcelain enameled reflectors Louvered shielding — (26°C-28°L) — 15% uplight

By George J. Taylor,

*Illuminating Engineer  
DayBrite Lighting, Inc.  
New York, N. Y.*

## INDUSTRY NEEDS

THE design and development of lighting fixtures has a direct relationship to brightness engineering, or balanced lighting. When these conditions are satisfied, then and only then can we expect to attain comfortable lighting.

Light sources in themselves are no better than the fixtures in which they are used. More often than not it takes greater ingenuity in developing a fixture to suit a specific lighting applica-

tion than that of developing the lamps. When new lamps are developed their first application for interior lighting follows the general practice of using them exposed or as bare lamps without any means of providing shielding or diffusion. This situation existed way back with the flame sources. But even then shielding was found necessary to still the flickering light of the flame, and later diffusing globes were used to reduce annoyance of brightness or glare. The pattern of fixture development for industrial lighting is shown in "Chart III. Industrial Reflector Development", and demonstrates progress and improvement in fixtures for industrial applications. Bare lamps at first were prevalent. By 1910, when incandescent lamps were gaining in efficiency and in greater watts per lamp, the brightness became intolerable.

Various "dishpan" reflectors were put on the market in an attempt to direct light downward and shield light sources from the normal line of vision. For some time in these early days of artificial lighting, a group of reflector and lamp manufacturers banded their ideas together, and through scientific study and investigation, RLM reflectors and specifications were born. They were considered as the standard for incandescent industrial lighting by the American industry.

The desirability of reducing the high brightness of filament lamps brought about the design of a glass enclosing unit known as the Glassteel Diffuser. It too, was a unit whose specifications were drawn up by RLM. The glass enclosing globe in this unit reduced the brightness of the filament materially and actually for the first time opened up an avenue for "quality" lighting in factories by "spilling" light to the ceiling.

Then fluorescent lamps were announced and proved to be the greatest

CHART III-INDUSTRIAL REFLECTOR DEVELOPMENT

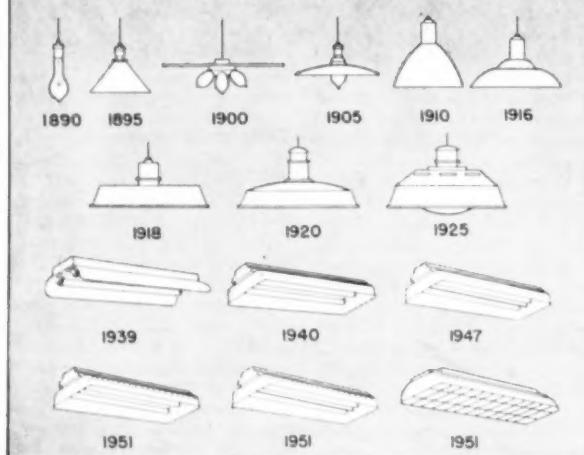
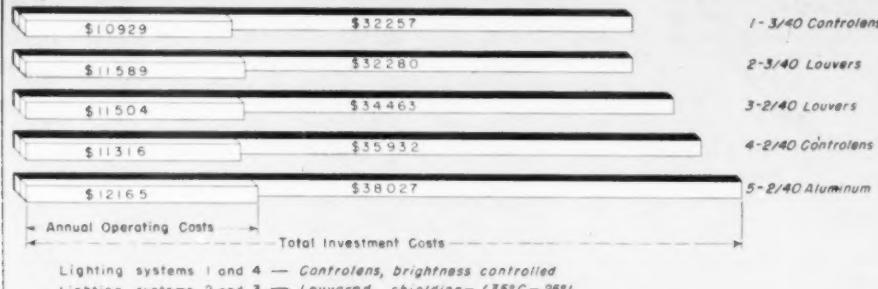


CHART V COMPARATIVE LIGHTING COSTS  
(Based on High Quality Lighting—Recessed (Troffer) Fixtures)



# QUALITY LIGHTING . . . PART II

boom to industrial lighting of all times. They literally lit industrial lighting up by the boot straps right out of the low level lighting with incandescent into the higher levels so necessary with most manufacturing operations. Fifty footcandles no longer was a dream—it was now an actuality, with fluorescent. With the advent of fluorescent lamps, the RLM group became even more active and drew up new specifications for fluorescent fixtures. Latest specifications by RLM will cover appropriate upward lighting and suitable shielding for comfortable seeing conditions.

#### Comfort of Seeing

In Chart III it will be noted that as the years rolled by greater shielding and diffusion was provided. The reason for this was in the demand or appreciation for softer lighting in achieving comfortable seeing. One important step lies before us in our approach for ideal lighting for production—fixture designs to combat ceiling gloom.

In 1942, the hurdle of adequate illumination levels was accomplished in good stride. Modern factories began using adequate footcandles in production areas. Since then, balanced brightnesses through improved fixture designs are already being realized, emphasized and installed. In 1952, we are faced with the necessity of providing quality lighting for production for

"comfort of seeing". Greater shielding of lamps is a requisite, together with higher upward components of light. Dark ceilings must no longer be tolerated. They must be lighted to avoid high brightness contrasts, conforming to the values given in Table I.

Brightness engineering demands a minimum of contrast or brightness ratio for good seeing conditions. Some industrial fixtures are available with an upward component of light of between 3% and 4%. This is scarcely enough for many critical seeing tasks in industry. Upward light in an amount of 15% to 25% would be more in order. There has been some hesitancy by industrial management to use anything but sturdy and strong fixtures. And rightfully so, for factory areas with its machinery and moving around of maintenance equipment requires the most sturdy lighting units attainable. Heavy duty channels with detachable porcelain enameled reflectors are almost universally used. No argument here either, except that improved upward light is in order; at least, in an amount of not less than 15% to reduce overhead brightness contrast.

There is a notable absence of comfort in many industrially lighted areas which brings about a sacrifice in production and in the quality of merchandise or goods produced. These areas can and should be comfortably lighted.

In some instances where seeing tasks are truly critical these production areas warrant lighting even more comfortable than office or classroom areas. It is a point worthy of much thought and serious consideration by all in the lighting profession and by manufacturing concerns using lighting equipment.

#### Improved Lighting Increases Production

Improved lighting means improved seeing, and leads to increased production. This is true because as footcandles go up and glare goes down, seeing becomes faster and more accurate. The benefits of these improvements appear in several ways. In the first place, the worker is enabled to turn out more work of the same quality. In the second place, danger of making mistakes is lessened and the worker is enabled generally to do more accurate work. This means less spoilage on the machine and fewer rejects at the point of inspection.

Even where operations are practically automatic, production can be increased because machine set-ups can be made more rapidly. Another contributing factor is the fact that repairs can be made to machines more quickly.

The influence of lighting on morale is surprisingly important. When people are not satisfied with their working conditions, there is no question but that their production suffers. Conversely, employees who like the place

[Continued on page 180]

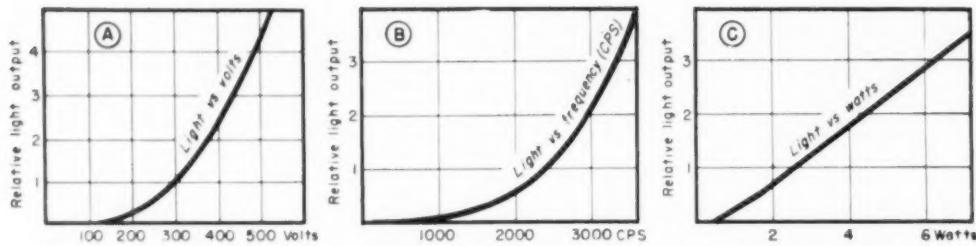


FIG. 1—A—INCREASED VOLTAGE . . . B—INCREASED FREQUENCY . . . C—INCREASED WATTAGE . . . results in increased light output of the Panelescent lamp.

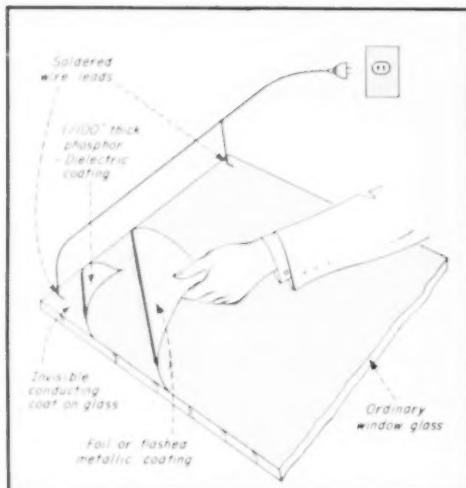


Fig. 2—CONSTRUCTION DETAILS of Panelescent Lamp.

**A** NEW electric light source was announced officially last June by Sylvania Electric Products Inc. This new "lamp," given the trade name Panelescent, uses a new and revolutionary method of producing light. It differs from other types of electric light sources principally in the way it produces light, and in physical form. Because of these and other factors it is a development of utmost importance to the lighting industry.

Panelescent produces light through the phenomenon technically known as electroluminescence. That is, light is created by the excitation of certain materials placed in a fluctuating electric field. Under proper conditions, these materials will continue to produce light so long as the changing electric field is maintained. These conditions are met in Panelescent by assembling certain key materials between thin electrical conducting layers

and then applying alternating current.

Sylvania engineers first reported on laboratory experiments with electroluminescence at the IES National Technical Conference in Pasadena, California in August, 1950. This report was subsequently published in the November 1950 issue of *Illuminating Engineering*. These engineers concluded that electroluminescence is apparently a direct transformation of electrical energy into light.

While Panelescent employs fluorescent materials, it is otherwise not at all similar to the fluorescent lamp. Neither is it like an incandescent lamp. Fluorescent lamps are in the form of a tube, or "line" of light. Incandescent lamps use a filament, and are essentially "points" of light, enclosed in glass bulbs. Panelescent, by comparison, is two-dimensional. It has length and width, but for all practical purposes it has no thickness. Thus it

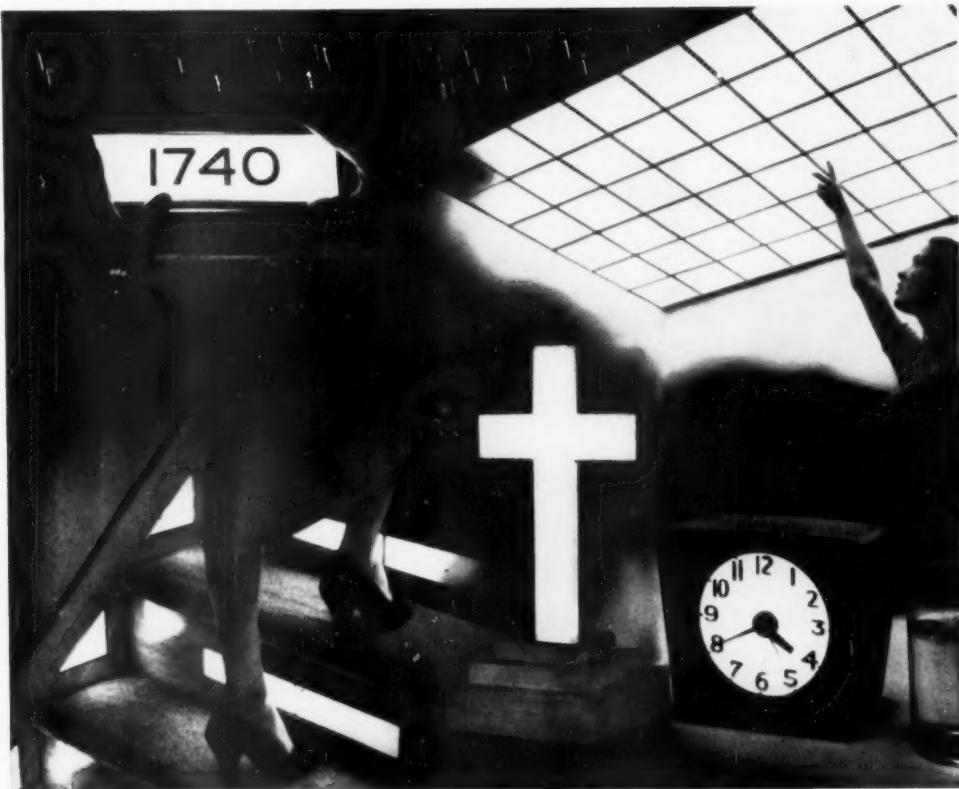
is a plane of light, or an "area" light source. It should provide the lighting engineer and the designer with an important third geometric form for lighting application purposes.

#### Technical Details

The basic construction of Panelescent is shown in Fig. 2. It comprises a film of phosphor dispersed in a dielectric and placed between two conducting plates. At least one of these conducting plates must be light-transmitting. It thus becomes a luminous capacitor, which might be described as a "sandwich" of light. In production, the phosphor-dielectric coating is applied to a thin sheet of conducting glass, and covered with a layer of vaporized aluminum. One electrical conductor is connected to the edges of the sheet, the other to the aluminum, and energized from a normal AC power supply.

## New Light Source

Panelescent, an area light source, marks a milestone in electric lighting progress, opens up new application techniques and new markets for artificial lighting application.



**PANELESCENT LAMPS** can be used directly to solve many lighting application problems which are difficult, and in some cases impossible, with other types of light sources. At the present stage of development they are applicable principally to the "dial-indicator-safety device" field, but as their basic

brightness is increased, their field of application will broaden rapidly. While Sylvania will actively promote new Panelescent lamp markets, engineers at the application level will find new and unlimited uses for this area light source as its details are made available.

Emission or generation of light from this luminous capacitor is contingent upon a fluctuating field intensity. Tests show that luminescence occurs when the potential is changing. Short bursts of light are emitted which are practically in phase with the voltage changes at the end of each half cycle.

Intensity of the emitted light is affected by several factors. The thickness, resistivity, and the dielectric constant of the phosphor layer are all important, as are voltage and frequency at which the lamp is operated.

The relation between light output and voltage for a typical lamp operated at 60 cycles per second is shown in Fig. 1A. The brightness of the lamp increases rapidly with the voltage over a considerable range of potential, with the threshold of visibility for this test sample beginning at 25 volts.

When operated at a constant voltage, light output also increases with frequency as shown in Fig. 1B. Similarly, light output increases with wattage consumption at different frequencies, as shown in Fig. 1C. The applied voltage used to obtain these data was 100 volts.

The color of the light produced by Panelescent depends principally on the phosphor used. Colors which have been produced experimentally include green, golden yellow, soft blue, and daylight white. Panelescent is now available only in green, but other colors are expected to be made available in the near future. One of the available lamp types has a luminosity of one-tenth footlambert and operates directly from a 120-volt, 60 cycle circuit. Another has a luminosity of two footlamberts, and operates from the secondary of a 600-volt step-up transformer on a 60 cycle system.

Panelescent sheets can be made in any size within the practical limitations of production equipment and handling, but for the time being is limited to panels a foot or two square. Phosphor-dielectric coatings can be applied to plastic, it has been determined experimentally, but commercial development of this process is not as far advanced as with glass.

#### **Applications and Markets**

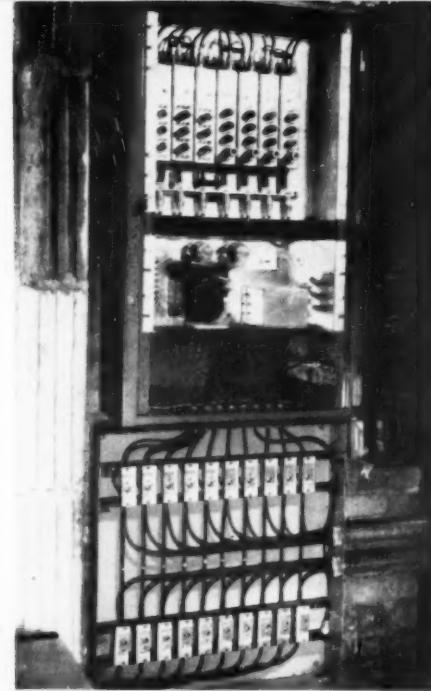
Long range, the end use applications and market possibilities for Panelescent are staggering. Development of this new "area" light source will probably be slow but steady. Much research will be necessary to find and develop new and more efficient phosphors, possibly new circuits, and other phenomena not yet known.

For the present, and in the months ahead, Panelescent in its present form

*(Continued on page 182)*



**ROOF ANTENNA SYSTEM** provides separate array for each of the area's seven commercial television channels. Each unit is individually oriented to secure best possible signal. All coaxial leads are interlaced into one conduit system, then carried to . . .



**ANTENNAPEX PRE-AMPLIFIER** where individual antenna signals are raised to correct strength for distribution. Completely-shielded coaxial cables are tapped by means of extension outlet units to serve secondary amplification stations.

## Television Standard for Hotels

**World's largest and finest hotel television antennaplex system serves 2500 receivers simultaneously with either standard programs from New York metropolitan studios or with closed-circuit presentations originating within the hotel itself.**

**By Frank E. Lorson**

Vice President, Lorson Electric Co., New York, N. Y.

**A** TELEVISION antennaplex system capable of supplying clear, sharp pre-tuned and pre-amplified pictures to more than 2500 TV receivers simultaneously has just been installed in New York City's Waldorf-Astoria Hotel. Strengthening the hotel's world-wide reputation for quality service, the system represents the

pooled engineering skills of a leading manufacturer, technical designer, electrical contractor and maintenance organization.

In many respects, the system is similar to RCU's community antennaplex systems. Seven separately-tuned antennas are mounted on 5 roof-based masts, providing for the seven chan-

nels now receivable in the metropolitan area. Signals are pre-amplified in the hotel's penthouse, then carried separately to secondary amplification stations where they are blended for further distribution over single coaxial lines.

While there are only seven commercial channels in the metropolitan New York area, ten coaxial risers run from the pre-amplifier, thus providing three spare cables for closed-circuit programs either beamed from outside transmitters directly to the Waldorf for private use, or originating within the hotel and televised solely for hotel patrons.

The largest secondary amplification station is located in the 6th-floor radio room. This master video control panel provides for the highly-flexible control of signal distribution to all public rooms, providing clientele with any desired number of outlets at any desired location. This feature makes it

possible for as many as 200 TV receivers to operate simultaneously in any public room, and it permits the hotel to provide manufacturers, distributors and dealers with means to demonstrate their products. Where the product is a television set, per se, the antennaplex system will guarantee top operation, and if the product is displayed in a distant factory or showroom, the mass use of receivers will provide simultaneous information to delegates to large conventions or conventions.

By using spare risers coming to the master video control panel from the penthouse pre-amplification station, the Waldorf can also distribute specially-transmitted exclusive telecasts (such as distant conventions, speeches, or sales meetings) to any one or more public rooms without interference with regular reception in other parts of the hotel. Or, if desired, programs originating in the hotel can be transmitted to patrons without resorting to outside facilities.

Already, programs originating within the hotel have been televised to guests; the television camera being a small RCA industrial ITV unit about the size of an amateur 16-millimeter motion-picture camera. This unit, together with portable accessory equipment, makes it possible to rapidly move from one location to another and is ideal for covering exhibits, displays, spectacles and large meetings.

#### **The Technique of Coaxial Tapping**

To maintain complete shielding, obtain maximum signal strength and minimize interference and feed-back from external sources, main coaxial feeders are run between amplifying stations in single lengths. For the same reasons, coaxial lines between amplifying stations, distribution centers, local transformers and TV outlets are also maintained as continuous runs. Continuous sections of coaxial cable are therefore fairly long, averaging between 500 and 600 feet and occasionally running to 750.

Where it is necessary to establish taps from these main-lines, connections are made through antennaplex extension outlet units. Each of these outlet units is composed of a frame, block, insulating bushing, resistor, ground screw and top plate assembly which includes a cable shield connector clamp and screw terminal for connecting the extension conductor. Tapping is accomplished without severing the main cable or removing its outer cover, shield or dielectric sheath. Neither soldering nor re-insulation is necessary.

In making a tap, the frame of the outlet unit is placed in its box and the main coaxial cable inserted in a groove running across this frame. The cable is then covered by a grooved block which is screwed down tightly to hold the cable firmly in place. Through a threaded hole in the block a ground screw is inserted and tightened until it pierces the outer rubber covering of the coax cable and establishes a positive contact with the shielding braid.

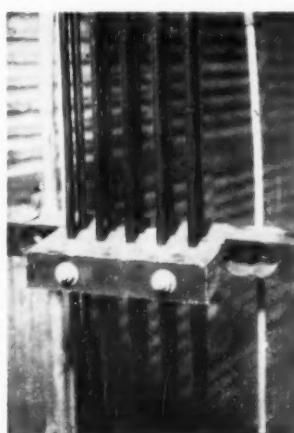
Through a second, unthreaded hole in the same block, a hollow circular cutter is inserted and rotated clockwise until stopped by a fixed, stepped shoulder. This boring tool cuts and removes a plug from the side of the cable, going down to the center conductor. This boring tool cuts and removes a plug from the side of the cable, going down to the center conductor. Distance from cutting surface to shoulder is such that the tool cuts through outer rubber covering, shielding braid and inner polyethylene covering but does not cut the main conductor. Bored chips of insulation and segments of shielding braid are then removed through the center of the hollow cutter by means of another special tool and, when the hole has been thoroughly cleaned, the cutter is removed and a slightly tapered plastic bushing is inserted in its place. Into this bushing a resistor is pushed, with one prong resting against the center conductor of the cable and the other prong protruding from the block. Resistor values are selected in accordance with characteristics of the individual circuit varying between 120- and 1000-ohms.

Connection of a branch coax line to the tapped main feed is initiated by pulling the end of the branch line through the front opening of the outlet unit top plate assembly and stripping the end of this cable so that approximately an inch of the center conductor,  $\frac{1}{4}$ -inch of the polyethylene and  $\frac{1}{2}$ -inch of the shielding braid is visible. The braid is unravelled, twisted into a single strand and secured to the top plate by means of a clamp which also holds the branch antennaplex cable in position. Thus, with shielding of branch lines grounded to cover plates by these clamps and with main coax shielding grounded to outlet unit frames through the previously discussed screws, continuity of ground throughout the entire installation is guaranteed.

After the branch line has been clamped, its center conductor is connected to a spring clip which, when the top plate is screwed into the outlet unit frame, exerts pressure on the resistor, making a positive contact with the main coaxial cable.

Before placing the system in operation, all connections were tested for both opens and shorts. This was to locate possible short circuits caused by stray strands of shielding braid coming in contact with the center conductor, and to locate open circuits caused by either improper contact of ground screws with braid or insufficient pressure of spring clips against resistors.

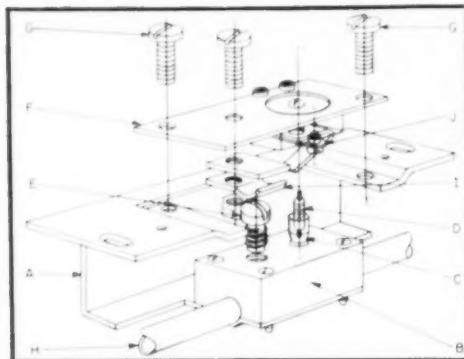
By tapping rather than splicing



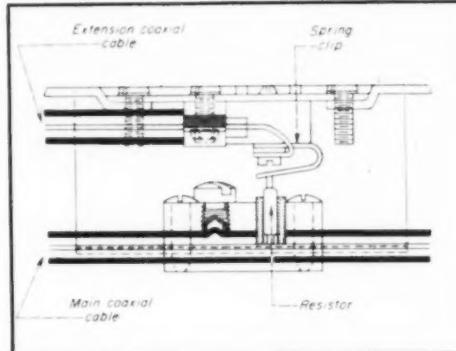
**TEN COAXIAL FEEDERS** (7 commercial channels and 3 spares) descend air shaft from 45th-floor pre-amplifier, supported by specially-designed ebony-asbestos segmented blocks fastened to two messenger cables. Feeders terminate at



**MASTER VIDEO CONTROL** panel on 6th floor, where signal strength can be so regulated by means of transformer jacks that from 1 to 200 receivers can be operated simultaneously in any public room in the hotel.



**EXPLODED VIEW** of antennaplex extension outlet unit shows (A) frame, (B) block, complete with clamping screws, (C) insulating bushing, (D) resistor, (E) ground screw, (F) top plate assembly, (G) mounting screws, (H) main coaxial cable, (I) clamp for holding extension coaxial cable and for grounding shielding braid, (J) spring clip to make contact with resistor.



**EXTENSION OUTLET** unit, seen in elevation after assembly, shows resistor with one end passing through drilled hole in rubber covering, braid and polyethylene sleeve of main coaxial cable, and resting upon center conductor, while other end is in firm contact with spring clip holding extension coax conductor.

coaxial cables and by pyramiding amplifiers and transformers, as many as 250 separate TV outlets can be supplied and controlled through a master video control panel. In fact, each amplification station actually constitutes a typical master antenna system, distributing blended signals through a single coaxial cable approximately the thickness of a pencil to all individual outlets.

In practice, outlets on any one branch line are limited to 15, and not more than four branches are tapped to any transformer. In cases where fewer than four branches are connected to a transformer, spare connection plugs are grounded with drops of solder through 72-ohm resistors to prevent interference and the decreasing of signal strength.

#### Suspension of Vertical Risers

Between the 45th floor penthouse pre-amplifying station and the 6th floor master video control panel, the ten main antennaplex 72-ohm coaxial cables (7 channel signals and 3 spares) are carried down the main air shaft. The existence of this vertical route for this purpose was fortunate, yet, due to the distance, it raised questions of cable strain, elongation, distortion and possible damage.

The solution, developed by Larson Electric, made use of two supporting 1/2-inch steel messenger cables, suspended approximately a foot apart, secured at the top and bottom of the air shaft, and sway-braced at several intermediate points. Between these messengers, at each floor level, ebony-

asbestos coax-supporting blocks were fastened by means of U-bolts. Blocks were made in three sections so that five cables could be held on 1-inch centers in grooves between the centerpiece and each of the two outer segments. Continuous-thread bolts pass through all three sections, with washers and nuts holding the second section against the first and the third against the second. Since the weight of the cable is comparatively small (80 lbs per 1000 ft), the maximum tension on any riser is about two pounds between suspension points.

Main coax cables are tapped at the 18th floor level to serve amplifying and distribution centers located at this elevation. Taps are made through antennaplex extension outlet units previously discussed. But while routing of main risers was simplified by the existence of the vertical air shaft, the extension of lines between amplifying stations, transformers and TV outlets in public and private rooms was a major problem. This was due to the facts that complete structural plans were not available, surface mounting or visible runs were to be avoided, and installations were to be made without inconveniencing tenants. As a result, considerable exploration and fishing was required so that lines could be carried to 2500 TV outlets through hung ceilings, shafts, closets and walls by fairly direct, yet by totally hidden, routes.

Routing problems were primarily confined to coaxial lines yet numerous instances arose where routing had to include ac power lines as well since,

like most New York hotels built in the '20s, the Waldorf still has sections served only by direct current. Rigid, flexible and thin-wall conduit was used for this purpose, and the very minor amount of cutting and patching is a tribute to engineering and workmanship of a high order.

Only two locations exist where the installation is surface mounted. Both are available to service personnel only: They are the roof, where all masts and antennas are initially interlaced into a single conduit system, and the 45th floor pre-amplification penthouse. In the former location, antennas rest solidly on roof tiles, with weathertight condulets and lateral conduit runs providing means for congregating the ten antenna lead-ins. Antenna masts and all conduits are galvanized, held away from parapet walls to prevent possible abrasion, moisture trapping and ultimate rust. In the second location, routing around the room is via surface-mounted EMT, grounded to the steel structure of the building through 4/0 bare stranded copper cables.

At the time of this writing, with about 20% of the hotel serviced by the antennaplex system, over 60,000 feet of 72-ohm coaxial cable is already installed, indicating that the total installation may well exceed 1-million feet.

Standard TV reception in the hotel is with RCA Victor 17-inch console units, specially modified to incorporate the hotel's radio distribution system with the television facilities. In operation, guests can either turn a control

(Continued on page 184)

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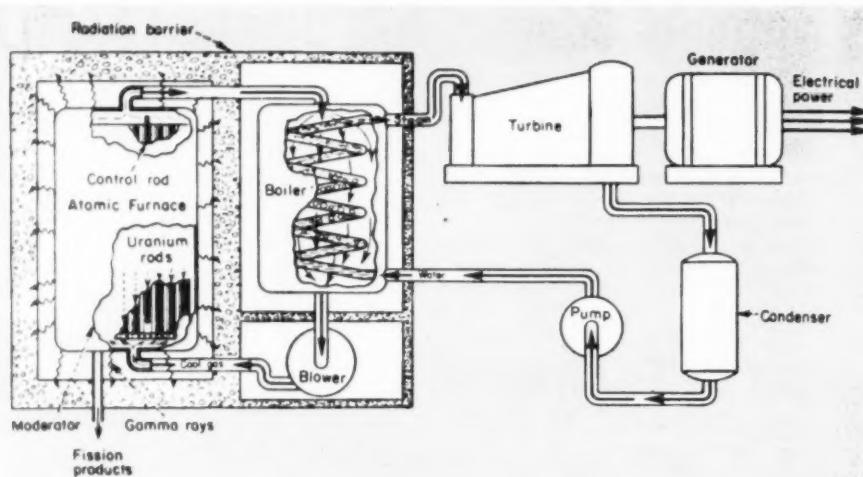
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Shown above are the principal units in the world's first atomic-operated electric plant—the nuclear reactor or atomic furnace, the heat exchanger, the steam turbine and the generator. The only part of this setup which is different from a conventional power plant is the nuclear reactor which is used here as a source of heat. Splitting

or fissioning uranium atoms give off energy in the form of heat. This heat is transferred to a molten metal which circulates in pipes through the furnace. The heat from the metal is then used to make steam which operates the turbine which drives the generator connected to the electric power load.

## Electric Power From Atoms

**Nuclear reactor operates pumps, lights and electrical facilities in historic trial run at Arco, Idaho**

**A** NUCLEAR reactor produced electric power for the first time in the world on December 21st. In a trial run the experimental breeder reactor at Arco, Idaho generated more than 100 kilowatts used to operate pumps and other reactor equipment and to provide light and electrical facilities for the building that houses it.

A liquid metal removed the heat energy from the reactor at a temperature high enough to generate steam to drive a turbine.

No economic significance should be attached to the production of power from this reactor at this time, according to Dr. Walter H. Zinn, director of Argonne National Laboratory where the pile was designed. The principal function of the reactor is

"breeding," the long-range goal of converting non-fissionable material into fissionable material more rapidly than nuclear fuel is consumed.

The power generation phase is incidental though historic, states the AEC. It is being carried out to secure experimental information on the handling of liquid metals at high temperatures under radioactive conditions and on the extraction of heat from a reactor in a useful manner.

The reactor is now presumably operating at full power rating since, in its "Tenth Semiannual Report to Congress," the AEC said that experimental amounts of power would be produced only when that point was reached.

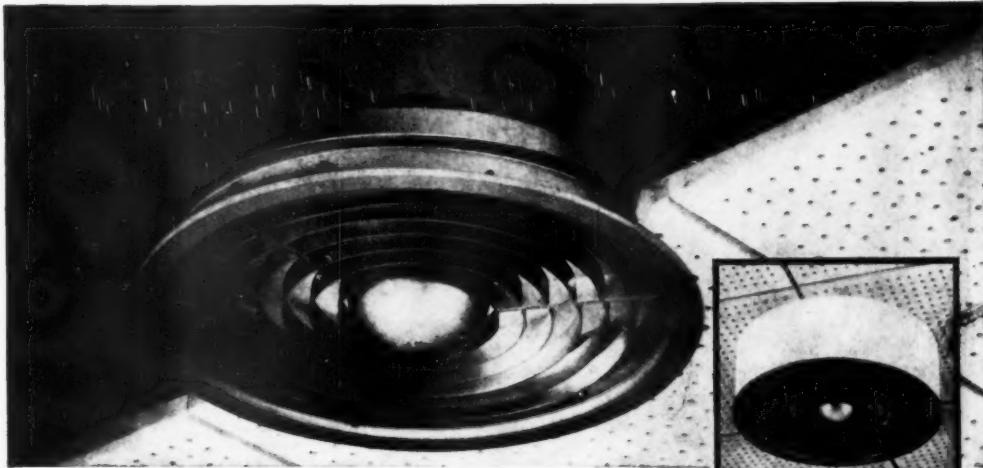
It may be some time before it is known whether the "breeding" operation is successful. The reactor, which is the first major one designed to operate with "fast" neutrons, is using enriched uranium as fuel and a blanket of natural uranium around the core as the "sterile" material in which breeding may take place. The rate of fuel burn-up will be compared with the rate at which the nonfission-

able uranium-238 in the natural uranium is converted into new fuel, fissionable plutonium.

The reactor itself and its principal components were erected at the Idaho Testing Station by the Argonne National Laboratory, with H. V. Lichtenberger as the project engineer. The Austin Company, Cleveland, designed the building and some of the reactor system. Construction at the site was by the Bechtel Corporation, San Francisco, under the supervision of the AEC's Idaho Operations Office headed by L. E. Johnston.

Total construction cost was about \$2,700,000. Approximately \$2,500,000 was spent by the laboratory over a four year period for research and engineering development.

Included in the construction cost are water supply, feeder power line, access road, excavation, fabrication of structural steel, and yard development, in addition to construction of the reactor building, cooling system, power take-off apparatus and controls. Also a part of this figure is the architect-engineering work and fabrication of reactor components.



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**1. Low Cost** — Silver-spot units require minimum initial investment . . . offer lower lamp-renewal costs than any comparable unit. The 100-watt silvered-bowl lamp uses less energy . . . generates less heat.

**2. Compact** . . . easy to install — Recessed Silver-spot units fit into an opening  $5\frac{1}{8}$ " deep by  $9\frac{1}{4}$ " in diameter. Surface-mounted Silver-spot units project only  $3\frac{1}{2}$ " below the ceiling.

**3. Easy to maintain** — Silver-spot fixtures can be relamped without removing louvres or handling fixture parts. A new lamp restores unit to initial efficiency.

**4. Comfortable lighting levels** — Silvered-bowl lamp provides completely shielded light source. Louvre provides 45° shielding of reflector.

**5. Selective light distribution** — Silver-spot units can be quickly changed to provide either floodlight or spotlight distribution. In either case, light output exceeds that of fixtures using 150-watt reflector or projector lamps.

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# Is Aluminum the Answer?—PART 2

Concluding a round-up of the pertinent facts as they appear today on a question of industry-wide importance and timely interest.

By W. T. Stuart

**F**OR equivalent current capacity, aluminum conductors weigh, ignoring insulation, about half as much as copper. They have about 70% of the tensile strength of their copper equivalent. Lighter weight is a distinct advantage, particularly in the larger sizes. Tensile strength is a relatively unimportant consideration in conventional interior wiring system installations since pulling-in force near ultimate wire strength would risk damage to the insulation.

Aluminum wire has a lower melting point than copper, 1216° F. (657° C.) as compared with 1981° F. (1083° C.). It is also less elastic, and the smaller sizes are more likely to break if nicked. It also tends to work-harden with handling. Under great pressure aluminum tends to "cold flow." The design of pressure connectors, therefore, include relatively larger contact surfaces and provisions for distributing pressure equally over the contact area.

#### Bus Bars

Aluminum bus bars have been used satisfactorily for many years. But what about enclosed bus systems of the type so widely used in industrial work today? Aluminum bus of the same cross-section as copper will have reduced capacity in the ratio previously noted or the bus cross-section can be increased to give equivalent capacity. It has a decided advantage in weight. The oxide and electrolysis considerations are also important in bus work. Joints and terminals on aluminum may be made up with oxide breaking compound. Copper connections should be heavily tinned.

Current development trends in enclosed bus systems, however, are toward plating the bus during manufacture to eliminate oxide and corrosion considerations at assembly and installation. The entire bus, or the areas used for connection and contacts are tinned or silvered. Other than reasonable care to prevent gross dam-

#### COPPER CONDUCTOR      ALUMINUM CONDUCTOR

Size AWG or MCM	Volt Drop phase-to-phase per Amp per 1000 ft	Size AWG or MCM	Volt Drop phase-to-phase per Amp per 1000 ft
14	4.67	12	4.75
12	3.00	10	3.02
10	1.86	8	1.90
8	1.21	6	1.21
6	.793	4	.790
4	.514	2	.509
2	.341	1/0	.336
1	.281	2/0	.275
1/0	.232	3/0	.228
2/0	.193	4/0	.190
3/0	.163	250	.169
		300	.148
4/0	.138	350	.134
250	.126	400	.124
300	.113		
350	.104	500	.103
400	.097	600	.098
		700	.091
500	.088	750	.089
		800	.086
600	.082	900	.082
700	.076	1000	.080
750	.075		
800	.073	1250	.073
900	.070		
1000	.070	1500	.069
1250	.067	1750	.067
1500	.065	2000	.065

Comparison of voltage drop of equivalent copper and aluminum conductors for ac circuits based upon 3 single conductors in conduit, 80 percent power factor, 3 phase, 78 degree C. conductor temperature.

#### PHYSICAL CHARACTERISTICS

Property	E. C. Aluminum	T. P. Copper
Density, lb/in <sup>3</sup> , at 20°C.	0.0975	0.323
Specific Gravity, at 20°C.	2.7053	8.94
Melting Point, deg C.	657	1083
Specific Heat, cal/g deg C.	0.2259	0.0918
Latent Heat of Fusion, Btu/lb.	167.4	91.0
Linear Coefficient of Expansion, deg C.	$23.04 \times 10^{-6}$	$16.42 \times 10^{-6}$
Thermal Conductivity, cal/cm <sup>2</sup> /cm/deg C. See	0.52	0.923



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**Right**—because units may be added or relocated later without the inconvenience and expense of special wiring.

**Right**—because behind the IBM Electronic Time System stands IBM's 50 year record of accuracy and dependability in time control.

IBM time equipment includes Electronic and Electric Time Systems, Program Signaling Systems, Nurses' Call, Fire Alarm, and Intercommunicating Telephone Systems, Recording Door Locks, Tower Clocks, Athletic Scoreboards and Timers.

\*Electric Time System with Electronic Self-regulation.

IBM, Dept. EC  
590 Madison Ave., New York 22, N. Y.

Please send data on IBM Electronic Time Systems, or on individual units checked.

A. B. C. D. E. F. G.

Name \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_



A. MASTER TIME CONTROL



B. ATTENDANCE RECORDER



C. INDICATING CLOCK



D. TIME STAMP



E. SIGNAL



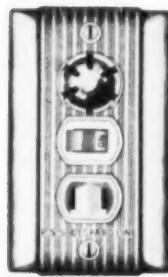
F. COST RECORDER



G. CONSECUTIVE SPACING RECORDER

## Is Aluminum the Answer?

... Starts on page 90



### P&S-DESPARD PILOT, SWITCH & OUTLET COMBINATION

Now, smarter appearing than ever with the new P&S UNI-LINE<sup>TM</sup> plate—easier to assemble with the new P&S Cam-strap.

## MAKERS OF FINE WIRING DEVICES For MORE THAN 60 YEARS

PRECISION MANUFACTURING

SKILLFUL ASSEMBLY

THOROUGH TESTING

**P&S Wiring Devices are designed and manufactured to unusually high standards for dependability of performance and ease of wiring. They meet or exceed the minimum safety standards of existing testing agencies.**

Sold Through Electrical Distributors  
For Complete Information Write Dept. M

**PASS & SEYMOUR, INC.**  
SYRACUSE 9, NEW YORK

age to the plated surfaces, such systems should involve no installation problem different from conventional copper bus.

Why not tin all aluminum conductors and forget oxide, corrosion and special joint and terminal techniques? The answer at this time appears to be largely economic. The process machinery is expensive. It would add to the cost of the wire or cable. If joint and terminal techniques on plain aluminum could be simple, permanent and foolproof, the added cost of coating the conductor might not be worth while.

In most of the work with electrical aluminum, the principal effort has been toward developing installation techniques to suit the characteristics of the metal. The above question is the other side of the coin, that is, how to adapt the metal to the peculiar requirements of the electrical industry. It may well be a more widely acceptable line of development than the course which has been taken up to this time.

### Prospects

The following list is this reporter's appraisal, on the basis of many conferences with contractors, manufacturers and development engineers—of the probability of satisfactory use of aluminum conductors in various applications.

"Good" indicates that experience is favorable and satisfactory installation techniques are available or in prospect. "Fair" indicates that the use of aluminum is feasible, but that there are adverse design, technical or economic factors. "Poor" indicates that satisfactory substitution is unlikely. (Tinned or otherwise coated conductors would probably upgrade each category at least one step.)

Probable Outlook for Aluminum Conductors

Feeder Busbar	Good
Plug-in Bus	Fair
Building Wire in Conduit	
C. M. sizes	Good
0000-6	Fair
8-14	Poor
Cable, House Wiring	Poor
Open Wiring	Fair
Portable Cords, Large	Fair
Portable Cords, Small	Poor
Signal Wiring	Poor

(Continued on page 94)

WIREMOLD 3000 MULTI-OUTLET SYSTEM  
FOR ELECTRIC SHOP

Typical of the electrical outlet convenience provided by the WIREMOLD 3000 Multi-Outlet System is the installation above work benches in this busy electric shop.

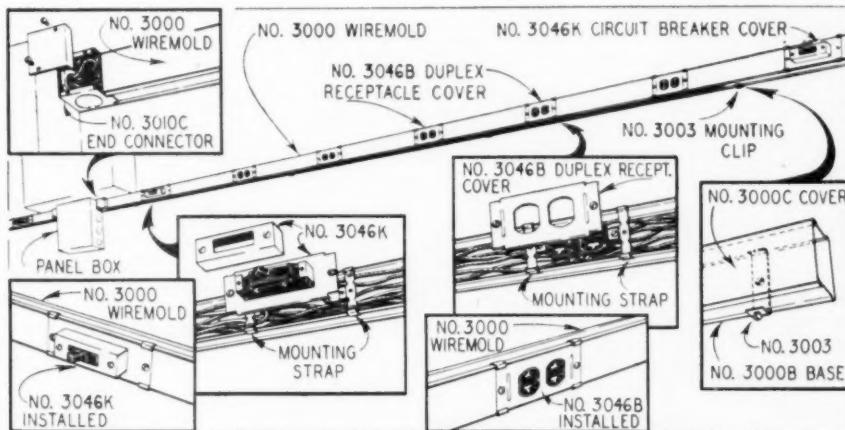
No. 3046B Duplex Receptacle Covers were used to mount the duplex receptacles in the raceway. No. 3046K Circuit Breaker Covers to mount the Quick-Lag Circuit Breakers. There is one such circuit breaker for every five duplex receptacles, which permits quick and convenient resetting of the breakers.

Clips furnished with each 3046 cover serve

a triple purpose: they (1) serve as wire clips; (2) serve as means for supporting the device in the raceway and holding it securely in place; and (3) hold cover plate securely in place. *These clips positively line up the device with the cover, minimizing installation time.*

**Wire Capacity:** 3000 WIREMOLD with devices in place: Type R or RH: 6 No. 6; 8 No. 8; 10 No. 10; 10 No. 12; 10 No. 14. Type T or RU: 8 No. 6; 10 No. 8; 10 No. 10; 10 No. 12; 10 No. 14.

For full details on this installation, send coupon for WIREMOLD Data Sheet F11.



THE WIREMOLD COMPANY  
Dept. A, Hartford 10, Conn.

*Please send me a copy of WIREMOLD Data Sheet F11.*

Name \_\_\_\_\_

Company \_\_\_\_\_

St. & No. \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

**THE WIREMOLD COMPANY**  
HARTFORD 10, CONN.



No. 5025-SLRG  
Grounded Lamp  
Guard with  
Concentrating  
Lens.

No. 5025-SRG  
Grounded Lamp  
Guard, Closed  
and cage.

# NEW completely grounded portable lighting

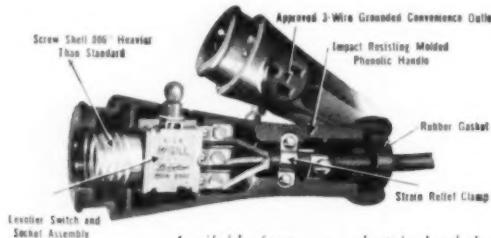
## McGILL® 5000-G series 3-WIRE Portable Lamp Guards

Now you can have completely grounded portable lighting that complies with all Underwriters' Laboratories requirements for 3 wire grounded electrical systems in so many modern plants. In addition the new McGill 5000-G Series Lamp Guards offer industry

the first fully grounded portable with an Approved 3 wire convenience outlet. Outlet design permits use of parallel blade plug as well as new grounding type with two parallel blades on a U shaped third blade. This provides a connection for grounding drills, saws or other power tools quickly at the working area — without extra extension cords.

The 5025-SLRG model has an impact resisting molded phenolic handle that is positively insulated. It is equipped with a lensed cage for illuminating otherwise inaccessible areas, a built in LEVOLIER switch and 16-3SJT red thermoplastic cord and new 3 blade grounding type plug. Available without cord and closed end cage as 5000-SG.

Select a suitable model at your electrical wholesalers or write for descriptive literature today.



Available from your electrical wholesaler

ONLY MCGILL  
MAKES Leveller  
SWITCHES

**MCGILL**

electrical  
specialties

McGill Manufacturing Co., Inc., 450 N. Campbell St., Valparaiso, Indiana

Is Aluminum the Answer?

... Starts on page 90

### Experience

From a recent questionnaire, out of 697 responses to the question "Have you used insulated aluminum wire or cable?" 170 contractors, or 24.4% answered yes. Another question to those who answered in the affirmative attempted to bring out their views. For what uses would you consider insulated aluminum conductor to be satisfactory?

Out of a total of 102 written comments in reply—

48 answered *none* or very limited use, or considered it satisfactory only for outside line construction.

27 answered large sizes only.

17 answered for general use under certain conditions of insulation.

10 answered in phrases which could not be classified in one of the above categories.

### Conclusion

On the basis of current reports the outlook for copper is dim, but might brighten with higher prices. Aluminum is scarce, but much greater supplies are in prospect. NPA is encouraging substitution of aluminum for copper against some resistance from copper producers.

The technology of aluminum conductor installation is well advanced, but not foolproof. It should be satisfactory in large conductor sizes on well manned and competently supervised work. There is a substantial background of satisfactory field experience.

Acceptance of aluminum conductors by electrical contractors is poor. Of a sample of contractors with aluminum experience about half report they do not believe it is satisfactory for interior wiring systems. About half the remainder found it satisfactory in larger sizes. Less than 20% believe it is satisfactory for general use.

Further field experience and engineering development should be encouraged. The possibility of "tinned" or coated aluminum conductor ought to be intensively explored. More on-the-job field engineering studies with the cooperation of electrical contractors is highly desirable. Aluminum conductors can become an accepted and satisfactory alternate to copper in many wiring applications.

"Here's a chap  
worked  
65 years...  
late only  
once!"

"In the future  
I hope  
he'll be more  
punctual!"



Perfection, philosophers say, is unattainable. But in designing Edwards signaling equipment, we keep striving for it. That's why today . . . and for the past 80 years . . . we've never been satisfied . . . why we keep everlastingly at the job of staying a step ahead through pioneer research and scientific planning. That's why we make Edwards equipment as dependable, trouble-free, efficient as human ingenuity can . . . nearly perfect as possible.

#### Time is Money to Contractors



Edwards equipment is designed to save the contractor valuable man hours . . . give him a bigger profit on every job. Here are a few examples:

- The new Edwards Fire Alarm Station can be mounted without balancing or juggling . . . wires connect to terminals from the front.
- The mounting plates of the Adaptobel and Adaptohorn can be fastened to any standard backbox.
- Edwards Easi-Mount Transformer can be installed through knockouts in standard backboxes by tightening the screw on the outside of the box.
- Program Instrument Backboxes can be mounted before plastering.
- Edwards Audio-Visual Hospital Equipment fits standard gang face plates and backboxes. Telephone jacks, outlet receptacles also can be mounted and ganged together.

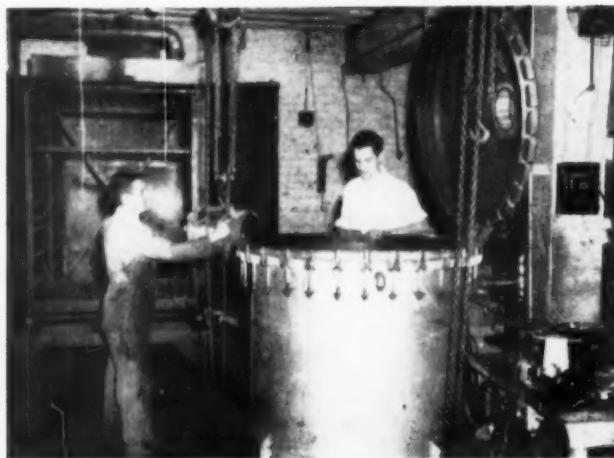
These are a few of the many Edwards advantages that spell maximum ease of installation, rugged, trouble-free operation with minimum servicing and maintenance. Time means money to contractors. Save it with Edwards.

For further information, write Dept. E-2,  
The Edwards Co., Inc., Norwalk, Conn.

# EDWARDS

*World's Most Reliable Time, Communication and Protection  
Products For Schools, Hospitals, Industry and Homes.*

# Motor Shops



**VACUUM IMPREGNATION TANK** is used by Ets-Hokin & Galvan, San Francisco motor repair shop, to treat stator and armature windings. Elmer Wild (left) and Ross Alexander, repair shop mechanics, place a stator in the tank preparatory to giving it a varnish vacuum treatment, after which it will be placed in the bake oven nearby (left rear).

## Varnish Impregnated By Vacuum

When Ets-Hokin & Galvan of San Francisco, who specialize in motor repairs and electrical construction, turn out a motor repair job, the customer may be sure the windings have been thoroughly impregnated and effectively coated. To do this job properly, they have installed a special vacuum impregnation tank through which all work must flow for treatment.

The vacuum impregnation tank is shown in the accompanying picture. The armature, stator, or other parts, after they have been wound and tested, are placed in the tank. Varnish is then pumped into the tank from a supply reservoir through a pipe line located in the floor. The tank lid is then closed and sealed tight with bolts attached to the tank around its top periphery. A wall-mounted compressor is then turned on which pumps a 28-inch vacuum in the tank. This vacuum is maintained in the tank for a period of 25 to 30 minutes, after which the vacuum is released.

The varnish is next drained back into the reservoir, and the tank is opened. Parts being impregnated are then hoisted out of the tank and placed in a nearby bake oven, where they are baked for a period of 12 hours at a temperature of 270 degrees F.

A chain pulley lift is used to hoist parts in and out of the vacuum tank, and into the bake oven. The hoist chain is attached to an overhead rail running from the tank to the bake oven.

Ets-Hokin & Galvan's main office and shop is in San Francisco. But they also have offices and shop facilities in Monterey, Los Angeles Harbor, Oakland, Stockton and San Diego, for serving industry promptly and efficiently throughout the California area.

## Control Board Spots Repair Jobs

Should a customer inquire as to the status of his repair job in the motor shop department of Barnes & Brass Electric Co., Clarksburg, W. Va., he can be given a positive answer in a few seconds. All the shop foreman has to do is consult a job control board in his office.

The large plywood board is ruled in vertical columns—one for each letter of the alphabet (A, B, C, etc.). Horizontal divisions number ten and in general indicate in which shop department the repair job is at the time. These identifying "stations" are inscribed on a metal panel hinged to the

left side of the board; include the following—inspection, dismantle and test, armature coil, field coil, winding, assembly, testing, road jobs, and delayed jobs.

Each alphabetical column has ten spring clips, one for each job station, to hold printed time cards for each re-



**JOB CONTROL BOARD** holds time cards for each repair job in the shop. Cards, arranged alphabetically according to customer name, are placed in proper "shop operation" category as repairs progress.

FORM 1A 3M 12-50  
Job No. \_\_\_\_\_

DATE RECEIVED \_\_\_\_\_

DATE WANTED \_\_\_\_\_

Owner \_\_\_\_\_

Apparatus \_\_\_\_\_

Parts Ordered \_\_\_\_\_

	Est. Hours	Start	Finish	Seen
(a) Dismantle & Test				
(b) Stripping				
(c) Clean				
(d) Shaft & Nuts				
(e) Bearings				
(f) Commutator				
(g) Armature Coils				
(h) Field Coils				
(i) Winding				
(j) Turn & Undercut				
(k) Brush Rigging				
(l) Assembly				
(m) Loading-Unload				
(n) Miscellaneous				
(o) Chg. Connections				
(p) Road Work				
(q) Press Work				
(r) Switch Gear				
Date Delivered				

**JOB CARDS** on board list pertinent customer and equipment identification, estimated and actual time for listed shop operations.



## Oilproof exposed windings quickly, easily ... with Irvington No. 32 Red Enamel

When your rewind jobs must have outstanding resistance to oil attack on insulation, here's a simple, low-cost way to assure long service life. Apply a finishing coat of Irvington No. 32 Red Oilproof Enamel to all exposed windings!

In addition to oilproofing the windings, No. 32 Red provides excellent resistance to chemicals, moisture, water and dust. It's low in cost, easy to apply—just brush it on over *any* type of insulation treatment.

At room temperatures, it dries enough to handle in  $\frac{1}{2}$  hour—dries hard in 8 hours. A low-temperature bake will speed up the drying still more!

No. 32 Red Enamel is exceptionally stable—can be stored for long periods of time till needed for use.

Get the full facts—mail the coupon for technical data.



**Send this convenient coupon today**

# Irvington

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Irvington 11, New Jersey

Plants: Irvington, N. J.; El Monte, Calif.; Hamilton, Ontario, Canada

Irvington Varnish & Insulator Co.  
6F Argyle Terrace, Irvington 11, N. J.

EC-2/32

Gentlemen:

Please send me your free technical data sheet on  
No. 32 Red Oilproof Enamel.

Title \_\_\_\_\_

Name \_\_\_\_\_

Company \_\_\_\_\_

Street \_\_\_\_\_

City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_



**"DOW CORNING  
SILICONE INSULATION  
HAS MEANT A  
CONSIDERABLE INCREASE  
IN OUR TOTAL VOLUME  
OF BUSINESS."**



MR. C. R. DURAND, Service Shop Sup't.  
H. N. CROWDER, JR. COMPANY  
Allentown, Pa.

**E**VERY motor that enters your shop is a failure. Quite often, a simple repair or rewind job will restore its usefulness. But many failures are repeaters. Those are the motors that come back to you again and again, simply because of the severe but unavoidable conditions under which they must operate. It's not your fault, but your reputation is almost certain to suffer. It's part of your job to make custom-built motors out of standard equipment.

That's where Class H insulation made with Dow Corning Silicones comes in. If a motor is subject to abnormally high ambient temperatures, high starting torque, overloads or excessive moisture, Dow Corning Silicones can make it last 10 times longer than it ever did before.

That's why more and more maintenance, production and top management men now specify Class H insulation for hard-working motors. Only Class H insulation gives them the kind of motors they need, and it pays for itself many times over by eliminating down time, wasted man-hours and replacement costs.

And that sets you up as an authority on difficult motor problems, too. You gain first consideration, even for ordinary jobs. You earn a better profit margin on Class H; you gain prestige and win those new customers that increase your total volume of business. That's why:

**Dow Corning Silicones Build  
Rewind Business!**

**Write  
Today**

For more information, technical or sales assistance, call our nearest branch office or write to Dept. G-14.

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**DOW CORNING  
SILICONES**

pair job in the shop. Each card has a list of 18 shop operations with columns indicating estimated and actual time spent on each, together with pertinent customer and equipment identification information.

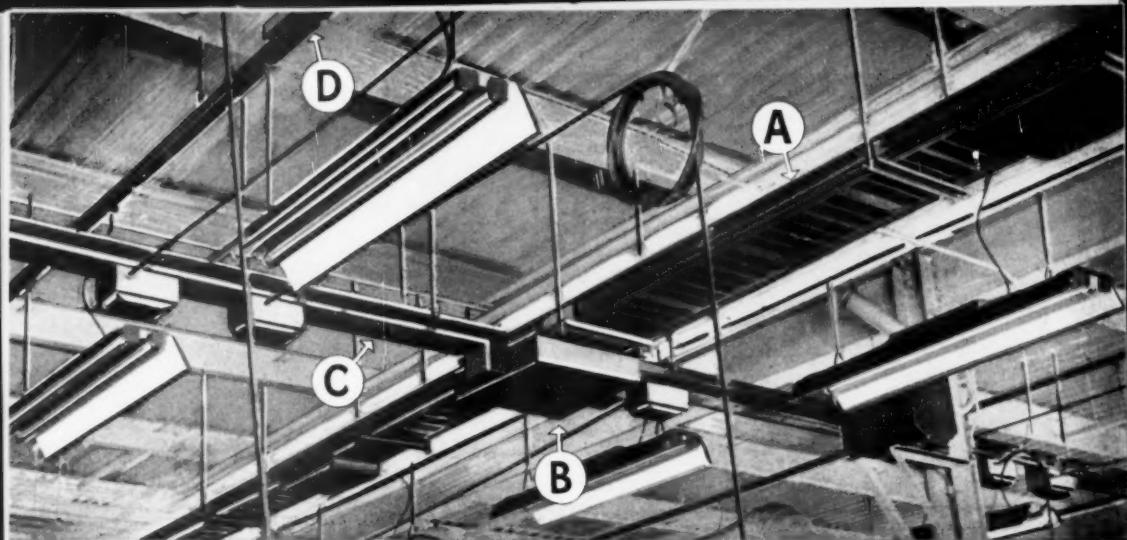
The system works like this. Take a customer whose name begins with "E." When his repair job first comes into the shop, the card is made out and placed in the "inspection" category in the "E" column. After the repair requirements are determined, the card is placed in the category in which the next operation falls (machine shop category illustrated in photo). As the job progresses through the shop the card is moved to the proper succeeding categories. This is done with all job cards. At the end of each day, when reports come into the shop foreman's office, the cards are rearranged accordingly. Thus, a quick consultation of the board shows the exact status of a repair job and the department in which it can be found at that time.

### **Helical Inserts Rethread Worn Bolt Holes**

One of our large eastern repair shops is using stainless steel helical-wire thread inserts to speed thread-repair operations on heavy electric motor castings. Used primarily to save time, these inserts are also effecting welcome dollar savings, and are capable of withstanding higher loads than the original threads. Stronger and more resistant than the originals, these inserts are installed in 80% less time than formerly-practiced repair methods, cost savings run as high as 60%.



STAINLESS STEEL WIRE INSERTS are placed in the drilled and re-tapped holes of heavy electric motor castings. This method saves time, money, material and effort while increasing the ability of the thread to sustain loads.



**MAIN FEEDER AT SEALED POWER CORP.** Trumbull LVD FLEX-A-POWER high-capacity feeder (A) distributes power through plant with minimum voltage loss. Can be dismantled, relocated with

complete salvability. Tap box (B) takes off power for FVK secondary feeders (C), 600-4000 amperes. LTG (D)—see below—is used for lighting. Bulletin TEB-1.

## SECTIONALIZED POWER FEED is ready for quick conversion

It is doubtful if any one of your customers can foretell what his power requirements will be months—or days—ahead.

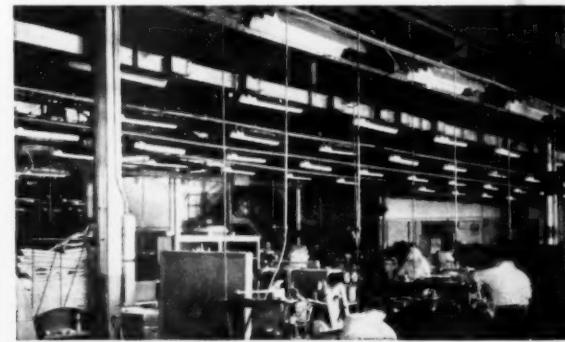
But if you sell him Trumbull FLEX-A-POWER® to handle the power distribution from main switch or breaker to machine or lamp . . . he can easily meet any new requirement for additional loads or rearrangement of loads.

This system of standard-section busways gives utmost flexibility in power take-off, and, if necessary, can be taken apart for quick relocation. Easier to install than wiring and conduit, it is ideal for a period when emergencies may develop any day, when complete conversion may be necessary.

We have literature for distributor use.



**LIGHT-DUTY BUSWAY** AT PESCO PRODUCTS Division of BORG-WARNER CORP. Use of LTG FLEX-A-POWER to distribute power to tools and lighting fixtures permits quick changes in machine layout without delay for rewiring. Busway can be tapped *at any point* by plug or trolley—every inch an outlet. Rated 50 amperes. Bulletin TEB-2.



**SECONDARY FEEDER** AT PESCO PRODUCTS Division of BORG-WARNER CORP. Nearly  $\frac{3}{4}$ -mile of 600 amperes, 440 volt Trumbull FVK FLEX-A-POWER takes power from a panelboard in parallel runs over entire area. 15 outlets to each 10-ft. section. No expensive rewiring needed when relocating loads. Can also be easily dismantled and re-installed. 225-1000 amperes. Bulletin TEB-4.

**TRUMBULL**  **ELECTRIC**

DEPARTMENT OF GENERAL ELECTRIC COMPANY  
PLAINVILLE, CONN.



## power outlet receptacles

rated: 15A, 125V.; 10A, 250V.



No. 5000



No. 5024



No. 5030



No. 223  
No. 222



No. 224

### The 5000 Line of Convenience Outlets

... for heavy duty use. T-slotted, parallel slotted, and three wire receptacle. With double sided contacts and underslung straps. In brown bakelite or in ivory.

### The Standard Line of Convenience Outlets

Sturdy units with single sided contacts. Made with or without plaster ears. In brown bakelite or in ivory

**CHOOSE FROM  
THE COMPLETE  
LEVITON LINE  
AT ALL LEADING  
DISTRIBUTORS**

Outlet Units available mounted on  
3 1/4 and 4 inch Outlet Box Covers



**LEVITON MANUFACTURING CO.**

BROOKLYN 22, NEW YORK

warehouses: Chicago, Ill., Los Angeles, Cal.

and sustaining loads have been increased up to 30% over the original thread load.

Three thread-repair methods were practiced before the insert technique was discovered. These former methods included (1) cutting an oversized thread, (2) building up the worn metal by welding, and (3) the solid-bushing method. In comparison to these former techniques, the wire-insert method has saved time, labor, materials and dollars in addition to producing a most-effective permanently-repaired thread.

The accompanying composite illustration indicates the condition of the original worn threads; it shows the insert before fitting and after it has been placed in position. As shown in the insert, the old threads were 13-6. These were drilled out and retapped with Heli-Coil taps of the same rating. The stainless steel helical-wire thread insert was then placed in position with a special inserting tool, and the notched inserting tang was then removed at a point slightly below the casting surface.

Since the new thread, before inserting is slightly larger than the receiving hole, it is self-locking when positioned, yet can be removed with another tool if found necessary at a later date.

These coils are precision-formed of 18-8 diamond-shaped steel wire, made by the Heli-Coil Corporation, New York, and have been found to resist abrasion and eliminate seizing, galling and corrosion.

### Welding- Soldering Device

Many pieces of shop equipment, which turn out to be great cost and work savers, can be made inexpensively and many times the salvage pile produces some of the needed material.

That is what Fred S. Stephens of Commercial Electric Company of Savannah, Ga., found when he sought solution to his requirements of a welding machine which would incorporate a soldering device.

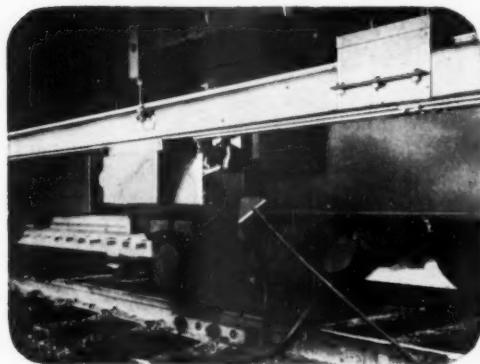
A wide variety of voltages was desired along with other features. The device for soldering lugs, large joints, commutators and other parts in the repair and winding of motors was especially desired.

The transformer was constructed in the shop and so designed that it could be used to test grid resistance on wound rotor motors and heavy winds, also used where high current is required.

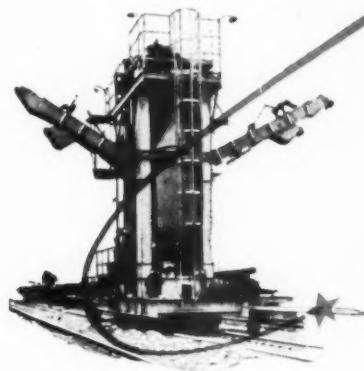
From the transformer various taps were taken for both primary and secondary to give voltage variation

From

## FREIGHT CAR ICING



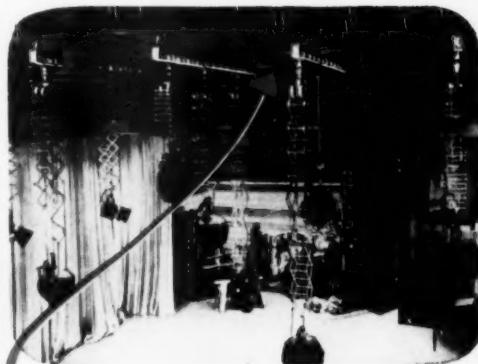
Above, track and trolley supplying current to one of two icing machines, shown below, developed by Railways Ice Co., and built by Link Belt Co., for Denver & Rio Grande Western R.R.



A freight car iced in fifty seconds! Only a ten second interval between cars! That's how trainloads of perishable freight are now iced and speeded to market on schedule. When this modern icer is on the move, power is supplied by Feedrail for twelve motors totaling 179 HP plus 7½ KW for communications, lighting and coded control. In telecasting, split-second timing to keep on schedule is essential. Feedrail mobility speeds the rearranging of studio lighting and provides a dependable, unfaltering source of power.

To

## TELECASTING



Feedrail powers and positions vertically heavy TV lights by a flick of a switch.

**ELECTRIC FEEDRAIL®**  
Mobile Power Outlets  
Move Jobs on Schedule



Industry is always on the move. Product changes demand flexible electrical power distribution. Moving Feedrail trolley outlets enclosed in overhead tracks roll quickly to where power is needed. When major changes are required — dismantle, rearrange and remount, reusing original units. Add or remove machines, without delay, to speed change-overs and work in process. Unit costs will decrease in direct ratio to the increased production facilities which Feedrail versatility affords. Write for literature.

Sold by leading electrical distributors.

46-B

**ELECTRIC  
FEEDRAIL®**

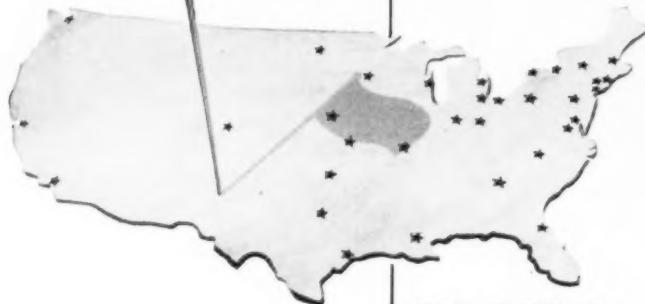
Never Becomes Obsolete

**FEEDRAIL CORPORATION**

Subsidiary of Russell & Stoll Company, Inc.

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***Snap-on***  
**Coast to Coast**  
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**SERVICE**



**SAVES YOU DAYS  
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 TOOLS FAST**



When you need hand and bench tools *now*, delivery next month won't help much! To give you service *now*—as well as to help you with your year-around tool problems—Snap-on's 42 factory branch warehouses listed here put a selection of more than 4,000 tools at your elbow. The Snap-on branch near you is staffed with tool specialists—men who know how to help you save production and maintenance time and increase safety by using the right tools. Let us send you copies of the latest Snap-on Industrial and General Catalogs.



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 EVERYWHERE THROUGH THESE  
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**SNAP-ON TOOLS  
 CORPORATION**  
 8048-B 28th Ave., Kenosha, Wis.



**FRED S. STEPHENS** of Commercial Electric Co., Savannah, Ga., demonstrates the ease in the use of the pencil type soldering device which he designed and constructed.

from 3 to 65 volts, with amperage up to 350 amp. maximum.

The soldering devices are energized from two leads from the transformer, installed in the basement shop, to the test board, and in the upstairs shop. Control of operation of the welding-soldering device is from two-way push button switches in the basement at the machine and at the test board. Thus welding and soldering operations can be done in either shop without shifting equipment.

This arrangement permits large equipment to be handled in the basement shop and small motors in the upstairs shop.

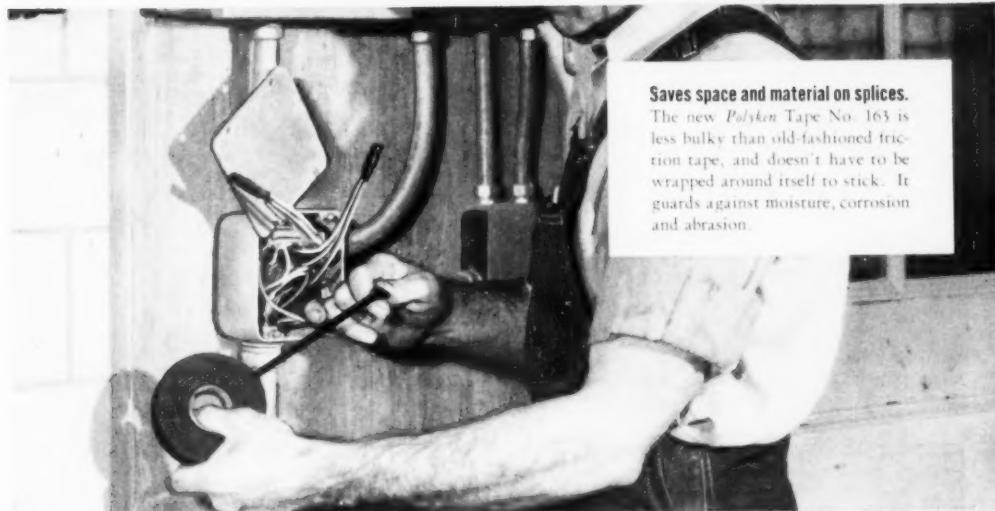
The low voltage tap, which is used for soldering, is wound with four insulated welding machine cables. The welding cable insulation was removed and taped with glass tape. This gives the capacity of the soldering portion of the winding to be such that several welding devices can be used at the same time in either shop.

This setup has saved the necessity of having several machines installed in different work positions. The central machine serves all welding and carbon-type soldering operations throughout the shop.

An instant soldering device was installed by tapping parallel wires from the soldering electrodes, breaking one of the lines through a magnetic switch. The holding coil of the magnetic switch is in series through a small pushbutton which regulates the heat of the soldering device. The current flows from the transformer through the magnetic switch to the brass electrode in the soldering device.

THE NEW  
**Polyken®**  
INDUSTRIAL TAPES

TAILORED  
TO YOUR JOB



**Saves space and material on splices.**

The new *Polyken* Tape No. 163 is less bulky than old-fashioned friction tape, and doesn't have to be wrapped around itself to stick. It guards against moisture, corrosion and abrasion.

## How to cut man-hours and speed up the job by changing tape

More and more men on the job today are finding that they can work faster, get more work done better in less time, and cut costs when they change from ordinary friction tape to the new *Polyken* Tape No. 163.

*Polyken* No. 163 is an electrical tape that costs less than many friction tapes, yet sticks better. It sticks to any surface, not just its own. It doesn't fray, and its adhesive doesn't come off on the user's hands.

This tape has remarkable resistance to rough wear and abrasion as well as to moisture and corrosion. It's one of more than 100 *Polyken* tapes that can serve you in as many different ways. *Polyken* tapes today can do many

things you never thought tape could do. Tear off the coupon and send in for free samples and booklet!

**FREE**

**Polyken, Dept. ECB, 222 West Adams St.,  
Chicago 6, Ill.**

For specifications, samples, and further information on this and other Polyken tapes, please send me your **FREE BOOKLET**, "Tape is a Tool."

Name \_\_\_\_\_ Title \_\_\_\_\_

Company \_\_\_\_\_

Street Address \_\_\_\_\_

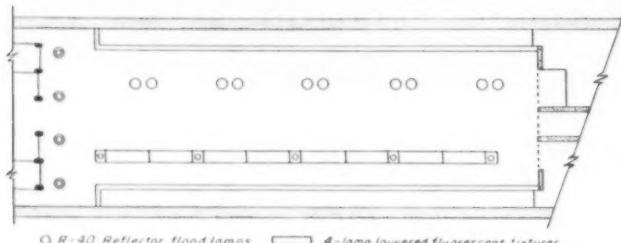
City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

**Polyken Industrial Tape, Department of Bauer & Black, Division of The Kendall Company**

# Modern Lighting



**JEWELRY DISPLAY** uses incandescent "punch" for sparkling jewels; cool, diffuse fluorescent for comfortable display of specular flatware.



**Fixture Distribution** provides attractive brightness contrasts, high intensities for appraisal, and effective display lighting.

## Integrated Lighting For Selling Jewelry

A "different" lighting design in Starr's Jewelry Store, Hamilton, Ontario, Canada, is meeting the challenge of stiff business competition by offering real sales appeal to the store. In this installation, fluorescent and incandescent units are combined to achieve lighting results which well serve the primary purposes of store lighting—attraction, appraisal and atmosphere. Concentrated and diffused light outputs offer a wide range of horizontal and vertical footcandles for effective display and easy merchandis-

ing of costly jewelry items and silverware. And, what is so necessary in store lighting, a comfortable brightness pattern of highlights and shadows enhances interior appearance and creates a strong sales environment.

A continuous row of recessed fluorescent fixtures provides general lighting for the circulation and merchandising areas. Located over the glass display counters, these 4-lamp commercial type louvered fluorescent units effect a cool, diffuse throw on the wall display cases behind the counters. For

added "punch" lighting on top of the counters, incandescent spotlights are located in the row, between each pair of fluorescent units. These spotlights relieve the flat appearance of the fluorescent light and provide high intensities for close appraisal of merchandise. The lighting combination in this row plays-up the richness of the merchandise by utilizing the highly specular reflection characteristics of multi-facet gems and of finely detailed gold and silver pieces.

Worthy of note is the position of the units in the continuous row. The complete length of the row is carefully placed just over the customer's edge of the counter to avoid uncomfortable bright reflections from the glass counter top to the customer's eyes. Such reflections would not only bother the customer, but would impair his ability to accurately discern the appearance of the merchandise on display in the counter case. As a further comfort precaution, all of the spotlights are directed down to avoid glare from such large specular surfaces as the silver trays in the wall display case behind the counter.

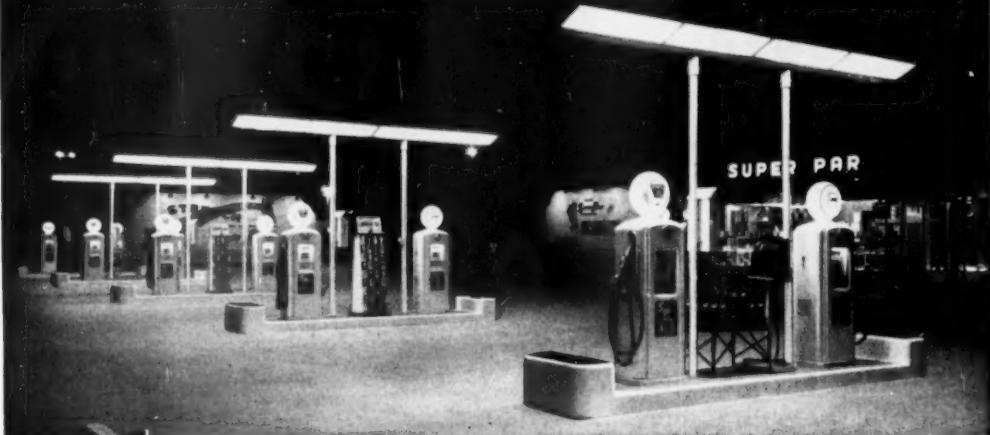
For display lighting of the wall cases on the opposite side of the store, and the display niche above the safe in the rear, a series of R-40 reflector floodlamps is used. Mounted in spun housings on swivels, these lamps are suspended in pairs from the ceiling, with the units of each pair at different levels for better light distribution. All of these fixtures are normally aimed slightly toward the rear of the store to reduce glare from the glass case enclosures.

The quantity of light in this installation compares favorably with recommended levels. The average illumination on top of the counter cases is 60 ft-c. On vertical surfaces, the footcandles vary from 35 to 50 on the wall case behind the counter and from 75 to 200 in front of the R-40 floodlamps. In the display niche in the rear of the store, 320 ft-c are effected. Throughout the store, brightness contrasts are gradual and not at all uncomfortable. Footlamberts vary between .87 on the floor center and 12 on the wall cases under the floodlamps. This brightness pattern builds customer interest throughout the store.

This installation was designed by the Lighting Service Section of the Hydro-Electric Power Commission of Ontario, Canada.

**The First Overhead Fluorescent Lighting Unit  
Expressly Designed for...**

# ISLAND LIGHTING



## *the Leader* "Station Master"

New, but tested and proved! The Station Master makes sales z-o-o-om to fantastic new highs!

Specifically designed to deliver high intensity of light at the selling zone, without creating a barrier of glare. Provides truly inviting lighting for the motorist, and reduces service-time per car.

The Station Master is Leader's answer to the need for modern glare-free lighting and efficient island illumination. No station is too small—or too large—to be deprived of Station Master sales-stimulating illumination.

AVAILABLE IN SIZES OF FOUR — EIGHT — OR SIXTEEN FEET



*Sold and installed by the better electrical dealers and contractors*

**Leader** America's No. 1 Lighting Equipment Manufacturer

LEADER ELECTRIC COMPANY • 3500 North Kedzie Avenue • Chicago 18, Illinois

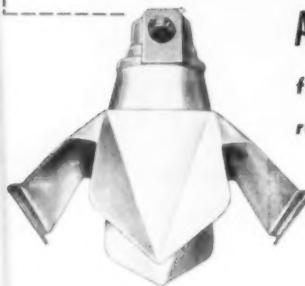
Leader Electric—Western: 800 One Hundredth Avenue, Oakland 3, California

Campbell-Leader, Ltd.: Brantford, Ontario, Canada

*"Even I know  
that the men  
in this office  
are enthusiastic  
over QUAD  
SALES"*



The logo for Quad Lighting. It features the word "QUAD" in a bold, black, sans-serif font. The letter "Q" is stylized with a large, hollow diamond shape on its left side. Below "QUAD", the word "LIGHTING" is written in a smaller, bold, black, sans-serif font. The entire logo is set against a white background.



"I hear the men talk," says this operator, "and I do hear a lot of good things said about Q U A D lighting."

Business in general finds that the right illumination on shelving bins, or stacks of cartons piled on either side of narrow aisles increases neatness and speeds up work. That is why more and more QUAD installations are being made.

This unique and practical type of reflector affords a scientific arrangement of reflecting surfaces. As a result, light reaches from upper tiers of shelving to floor level. There is an effective eye shield also that is appreciated by the stockroom employees and that facilitates work. This feature is accomplished because of a lower light cut-off angle at each end of the reflector.

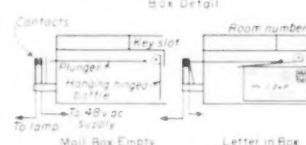
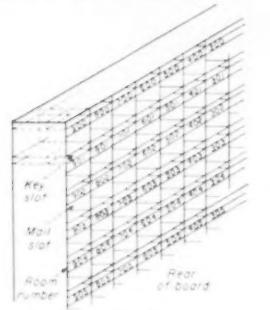
These units are accurately formed of heavy gauge steel, porcelain enameled with ground coat and two white coats inside and outside. Four interchangeable styles of Q-D socket-fittings are available.

## Lights Announce Hotel Mail

The use of lights on the main board of the LaSalle Hotel in Chicago serves the double purpose of improving the service and safeguarding the guests. Service is improved because guests can quickly note whether or not they have mail, thus making it unnecessary for desk clerks to answer hundreds of unwarranted inquiries. And safety of guests' belongings is insured by making it impossible for strangers and



**INDICATION LIGHTS** tell guests of the LaSalle Hotel, Chicago, when they have mail. Yet, since the content of the individual mail boxes is not visible from the front of the board, it is impossible for unauthorized persons to note the presence or absence of keys. This is a deterrent to prospective thieves.



**CONSTRUCTION OF MAIL BOX** indicates method by which hinged baffle pushes plunger against spring contacts to complete light circuit when a letter is inserted in the mail compartment. Contacts spring apart and light goes out when letter is removed. Key slot is located immediately above box.

# QUADRANGLE MFG. CO.

Lighting counselors of the Philadelphia Electric Company achieved a fine degree of lighting effectiveness in these two store installations. The Gilbert Store measured 50 footcandles throughout, with 125 footcandles under the Spots, the Fitzpatrick Store 65 footcandles, each measured after 300 hours of operation.

Wakefield Grenadiers and Pacemakers are of a popular louvered design that provides a direct-indirect light

distribution. They give effective over-all illumination, and at the same time lend a sparkle to merchandise that stimulates customer interest. Louvers provide 35° shielding normal to the lamps and 25° parallel.

Each type of luminaire is available in stem, canopy, and on-ceiling models, in four or eight-foot units or in continuous runs. They're designed for easy installation (a one-man job!) and are economical to maintain.

## Wakefield Over-ALL Lighting



# DON'T GAMBLE!



Prolong insulation life  
with **ELECTRO'S SuperSeven**

Electro's improved <sup>Patent Pending</sup> Fiberglas<sup>®</sup> increases the life of Class "B" insulation. Check the seven super features of

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*You may buy with confidence when you buy*

**ELECTRO-TECHNICAL PRODUCTS**

DIVISION OF SUN CHEMICAL CORPORATION

**NUTLEY 10, NEW JERSEY**

\*T. M. Reg. U. S. Pat. Off. by Owens Corning Fiberglas Corp.

unauthorized persons to note whether or not a key is in the slot. This is an important detail, for experience has indicated that many hotel burglaries are planned by thieves who check the movement of guests by the presence or absence of the keys in the mail slots. At the LaSalle, letters and keys are placed in the respective boxes from the rear, so the content of a box cannot be noted from the front. Lights indicate the presence of mail only.

The theory of this unique mail board was conceived by Ray Steffin, president of the hotel, who discussed the idea with Rapp and Rapp, architects and consulting engineers of Chicago. Details were worked out by them.

As indicated by the detail sketch of the boxes, a hinged baffle plate hangs down over each box entrance; a plunger extends along the top of each box, protruding into a contact chamber, and these chambers contain spring contacts for activating the lamps on the front of the board. When a letter or package is placed in a box, the hinged baffle plate is raised, moving the plunger forward, closing the contacts and making the lamp operate. A small shelf above each box holds the room key, and the room number is clearly indicated on a metal lip between key shelf and mail compartment. When the mail is removed by the clerk to give to the guest, the weight of the hinged baffle plate causes it to again drop over the opening, releasing the slight pressure on the plunger. And, with the plunger back in its original position, the spring contacts open and break the light circuit.

The current on the board is 48 volts ac, with a 2 amp fuse on each circuit. Dry transformers step 115-volt service to the utilization level of the board. A master switch is also provided so that all lamps can be turned on simultaneously when maintenance men are checking the board for lamp failures.

## Drug Store Lighting Designed For Sales

High lighting intensities and comfortable brightness patterns create an effective sales environment at Jury and Lovell's Drug Store, Oshawa, Ontario, Canada. In this lighting design, three systems of luminaries are combined in a functional fixture layout which conforms to the asymmetric plan of counters and showcases. Lighting results, combining the flat effect of diffuse fluorescent with incandescent highlights, are well suited to the varied seeing tasks throughout the store.

Large rectangular areas of plastic louvral cells are the most prominent

FOR YOU IN '52



## NEW IDEAS IN LIGHTING

from Guth . . . 50 years young and still pioneering

Year after year since 1902 the industry has looked to Guth for new and improved lighting fixtures. It's looking again in 1952.

Guth is preparing some pleasant surprises for you. Can't tell you much about them yet . . . some are still on the drawing board, others are being readied for production. But you can be sure all of them will mean better, more efficient lighting.

be looking for:

- 1 An extraordinary new Louvre
- 2 A Telescope Fixture that stretches your warehouse space . . . and your dollar
- 3 New and revised Fluorescent designs
- 4 An Incandescent line years ahead



Guth is now in R-L-M N.E.M.A. Fleurolier

**LIGHTING**

THE EDWIN F. GUTH COMPANY / ST. LOUIS 3, MISSOURI

Leaders in Lighting Since 1902

# "SUPERSPOT"



100,000 CANDLEPOWER  
FOR ONLY 300 WATTS

Brilliant illumination for outdoor service. Single spots or clusters—with interchangeable mounting accessories for wall, pipe or  $\frac{1}{2}$ " conduit. Cast aluminum throughout. UL approved.



"CUSHION SEAL"  
LAMP HOLDER

For extra lamp life with *any* lamp in *any* weather. Provides maximum lamp cooling and perfect weathersealing of all lamps—long or short—PAR-38 or R-40. Cast aluminum throughout.



ROLLA-TRAY  
LIGHT

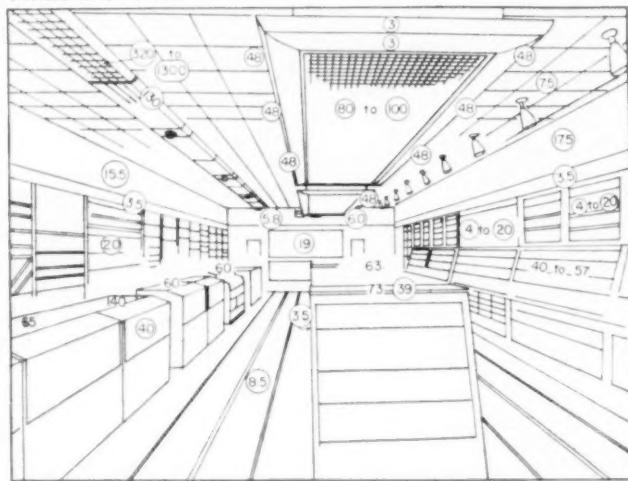
A "pull-around" utility light with carry-all tool tray for general car shop use—indoor or outdoor. Glazed heat-proof porcelain socket for reflector floods or heat lamps. Cable included.

- Write today for catalog and illuminating data, Stonco Electric Products Company, 485 Henry Street, Elizabeth, New Jersey.

# STONCO



LOUVERALL SECTIONS, shielding six continuous rows of fluorescents, combine with 4-lamp commercial fluorescent fixtures, adjustable spot lamps and "bullet" shielded R-40 floods.



FOOTLAMBERT READINGS (circled figures) indicate brightness ratios for effective display and seeing ease. Other figures show footcandle levels throughout the store.

elements in the overall design. Two such sections are flush mounted on the ceiling over the length of center floor display cases. Each of these louverall sections shields six continuous rows of fluorescent lamps. Bordering each of the sections, a cove of brushed chrome metal shields a single continuous row of fluorescent lamps. Indirect lighting from these cove fluorescents brightens the ceiling and relieves harsh contrasts.

On one side of the store, 4-lamp commercial fluorescent units are suspended in a continuous row one foot from the ceiling. This row of louvered fixtures with luminous diffusing sides is mounted above the counter edge on the customer side to avoid annoying glare from the glass counter top. Between the fluorescent fixtures in this row, adjustable spot lamp units are

mounted with the lamps oriented to accent feature displays.

The third luminaire system used in this interior is a row of R-40 flood lamps in spun metal "bullet" shields. These units are suspended from the ceiling on swivel mounts in front of the wall display cases on the other side of the store.

Lighting levels effected by this design stimulate "high traffic" merchandising and "impulse buying". The average level on counters and horizontal display is 60 ft-c; on vertical spotlighted display shelves, 75 to 150 ft-c; and on the vertical display cases, 40 to 60 ft-c.

The installation was made by Eastern Electric Construction Ltd. of Oshawa. Lighting design was by the Hydro-Electric Power Commission, Ontario, Canada.

# It Shouldn't Happen to a Dawg

By  
BILL CRAMER

THEY NEVER REMEMBER  
A SCENE LIKE THIS...

"GOSH, THAT LIGHTING  
LAYOUT LOOKS SWELL!  
BUT CAN'T WE GET THE  
SAME RESULTS BY  
**SUBSTITUTING**  
A CHEAPER  
FIXTURE?"

"THERE'S NO  
**SUBSTITUTE**  
FOR  
**DAYBRITE**  
MR. CHISELPRICE  
BUT...  
IF YOU INSIST..."

"THERE WE GO  
AGAIN!  
SENDING A BOY  
TO DO A  
MAN'S JOB."

WHEN LATER THE PLACE  
LOOKS LIKE THIS...

"WHOEVER CALLED YOU A  
LIGHTING EXPERT? LOOK  
AT **THIS MESS!**  
WHAT ARE YA  
GONNA DO  
ABOUT IT?"

"WHAT **CAN** HE DO?  
OLD CHISELPRICE  
ASKED FOR TROUBLE -  
BUT YOU KNOW WHO'S  
**THE FALL GUY!**"

THANKS TO MANY  
CONTRIBUTORS

Can you supply a cartoon  
idea for this series? We'll  
pay \$10 for any idea we  
use. Write to address below.

## Sell Day-Brite Quality

... and this will never happen to you

Why risk your reputation or lose your shirt (to say nothing of future business) because you let a customer sell *you* on "substituting"?

It's good business to sell Day-Brite quality *always*... because it's the one line of lighting fixtures that protects your recommendation... and delivers the lighting job your customers expect!

It's good business to *stick with* your Day-Brite specification. Your customers are human, too. They'll

take the advice of a lighting expert... if you'll give them the reasons why. It may take some selling on your part, but it pays off in profits and satisfied customers!

If you haven't sold Day-Brite, you don't know how much you can gain... in customer good will and cash in the pocket. Write us for details. Day-Brite Lighting, Inc., 5402 Bulwer Avenue, St. Louis 7, Missouri.

*In the Famous Day-Brite Line* • the *Viz-A-Dir*\* • the *Plexline*\* •  
the *Lenox*\* • the *Lurex*\* • the *Ranger*\* • the *P.B.M.* • the *Day-Line*\*  
• the *Tur-A-Top*\* • the *Day-Frame* • a complete line of *trifers* • exit  
signs • wallcase, showcase and fitting room fixtures • light strip.

"DECIDEDLY BETTER"  
**DAY-BRITE**  
*Lighting Fixtures*®





# I Quit the Juggling Act by Using G-E TIME-DELAY RENEWABLE FUSES

Now it's easy to replace fuse links and it only takes a moment. There are only three parts to handle when I renew the link section of a ferrule-type G-E renewable fuse. All I have to do is—unscrew the cap . . . insert a new self-aligning link . . . and replace the cap. It's that simple.

The knife-blade type is just as easy because the slotted ends of the fuse link slip right on the fiber bar support and the new style clip holds it in positive mechanical connection. Then I simply tighten the screws and insert this combination and replace the cap. I'm glad I have no small loose parts to juggle.

**I cut emergency calls with...**

## G-E TIME-DELAY RENEWABLE FUSES

I keep emergency calls at a minimum, now. I find that G-E time-delay renewable fuses "ride-out" noncritical current surges and keep circuits alive. The accurate time-delay action saves us needless replacements despite the number of harmless transients so frequently encountered in industrial use. I have less emergency calls because the heavy link sections of G-E time-delay renewable fuses absorb the heat of momentary overloads; but the narrow sections blow fast for shorts and harmful overloads—give us quick protection when we need it. I'm sold on the way G-E time-delay renewable fuses save our time.



## I've standardized on... G-E TIME-DELAY RENEWABLE FUSES



I've got more time to do other things now, thanks to our program that keeps fuse replacements low. I've standardized on G-E time-delay renewable fuses and always have the full range of sizes on hand to take care of almost every job. I stock complete fuses and renewal links for the ferrule type for 250 v and 600 v in sizes from 3 to 60 amp and the knife-blade type for 250 v and 600 v in sizes from 70 to 600 amp. Now I'm prepared to restore power in a jiffy.



You, too, can get the extra-dependable service of the accurate time-delay features of General Electric renewable fuses. Make sure you stock the sizes for all your commonly used circuits. If you'd like further information, write to Section D77-218, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

*You can put your confidence in—*

**GENERAL**  **ELECTRIC**

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330 West 42nd St.,  
New York 36, N. Y.

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Electrical Construction and Maintenance is written for you by a large staff of editors and consultants, each an authority on some phase of the business. They will be glad to give you expert advice and answers to your questions.

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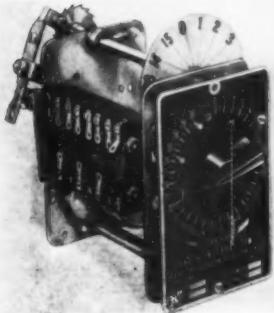
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For information on New Products or New Literature—

See other side of this page.

# Product News



**Interval Timer**

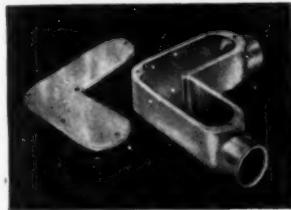
(1)

Equipped with an automatic counting device, this new indexing interval timer is designed to time and tabulate individual steps in an overall operation. Unit has many industrial applications throughout the process and service industries where it is desirable not only to start and stop various steps, but to record their progress so that the operator can tell at any given time which ones have been completed. As many as 15 separate steps are automatically registered on the counter dial each time the timer is set for the next part of the cycle. Counter may be reset at any reading on the dial by pressing a button located at side of time setting knob.

*Zenith Electric Co., 152 W. Walton St., Chicago 10, Ill.*

with or without blower unit. Cabinets over stove conceal blower unit and vent, and permit a symmetrical design. Two models of blower unit are offered, 300 and 425 c.f.m. Aluminum foil filter prevents grease accumulation in blower and washes clean with any household detergent. Hood is made in two styles: Provincial scalloped design in copper baked enamel finish and Aristocrat, a modern design in white baked enamel and many popular colors.

*Stanley Corporation, 6900 San Fernando Road, Glendale 1, Calif.*



**Fittings**

(4)

A new equal ell for use with rigid conduit has been announced. The interior of ell is smooth-finished. Inside walls of elbow are rounded so that wires slide with equal speed and facility through entire length of body. Removable plate is full size of body and affords full accessibility. One of the features is that when you hold one arm of the body in a vertical position you have a left angle ell. But when you hold the other arm vertical it's a right angle ell, with the removable plate in front and handy in both cases. Available in a range of standard sizes. It is made of malleable iron.

*Gedney Electric Company, RKO Building, Radio City, New York 20, N. Y.*



**Lighting Panel**

(3)

Announcement has been made of the expansion of the NMO "Plug-in" Panellette line. They are now available with either lugs or circuit breaker mains from 2 to 40 circuits for use on ac lighting and appliance branch circuit applications. Four standard basic devices of 12, 20, 28 and 40 circuit combinations are available, including space for future circuits. These lighting panellettes incorporate thermal-magnetic "plug-in" circuit breaker units (rated 15, 20, 30, 40 or 50 amperes) mounted on cylindrical bus bars. Circuit breaker units are interchangeable with those of the MO-12 and MO-20 load centers. They carry Underwriters' Laboratories approval and label. They are available for use on single phase, 3 wire or 4 wire three phase, ac systems.

*Square D. Company, 6060 Rivard St., Detroit 11, Mich.*



**Receptacle**

(5)

A new 20 amp, 2 wire "T" polarity flush receptacle has been announced. Molded of bakelite, it is especially designed for heavy industrial use. It will accommodate all standard single outlet plates. It is listed by Underwriters' and is rated at 20 amp, 250 volts. Also available are two companion items—2-wire polarity cap and cord conductor.

*Rodale Manufacturing Co., Inc., Emmaus, Pa.*



**Kitchen Ventilator**

(2)

A newly designed kitchen ventilating hood that fits standard kitchen cabinets is now available. Hood fits low over range and traps by-products of cooking at source, thus increasing efficiency of exhaust blower unit. Back panel extends to cooking top. Ventilator incorporates lights and switches under nose of hood and is equipped



## *Midwest Electric Mfg. Company*

MANUFACTURERS OF ELECTRICAL WIRING PRODUCTS

1039 W. WALNUT STREET  
Chicago 12, Illinois



#### Switchgear

(6)

A new standard line of metal-clad switchgear, ranging in ratings from 2400 to 13,800 volts, 150 to 500 mva, has been announced. The new line offers many new and improved design features, although it retains the same general arrangement of major components. One of these new design improvements is in the magne-blast circuit breaker, in which a maximum number of parts are interchangeable among breakers of different ratings. Another feature is an electro-mechanical control device, built integral with breaker mechanism. A new and improved insulating material is used throughout the breaker. Another design improvement simplifies the breaker elevating mechanism which has a new positive acting mechanical interlock. The line has recessed screened vertical openings which provide top ventilation. Cable entrance facilities are interchangeable from top to bottom entry.

*General Electric Company, Schenectady 5, N. Y.*



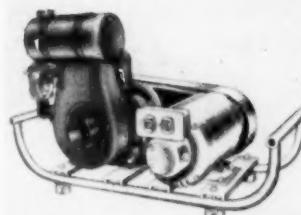
#### Outlet Box Finder

(7)

A new portable instrument, the Plaster-Eye electronic outlet box locator, enables electricians to find outlets which have been plastered over or covered with other material during building construction. It is powered by a self-contained battery, utilizes a

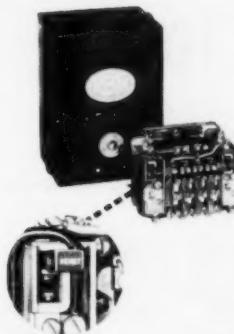
high frequency field to locate covered outlets. To operate, the button on top is depressed and unit is moved over the area to be searched. When directly over the hidden box the indicating needle swings upward. A zero setting control permits the user to balance out the effect of metallic lath when encountered.

*Plaster-Eye Company, 2560 No. 25th Street, Pittsburgh 5, Pa.*



able power tools, floodlights, police radio systems, etc. Available in three general ratings—1000, 1250, and 1350 watts at 115 volts, 60 cycles, ac. They are equipped with sealed ball bearings. The belted construction cushions shock to generator, reduces vibration and increases generator life. Unit is equipped with a universal mounting base.

*Wimco Inc., Sioux City, Iowa.*

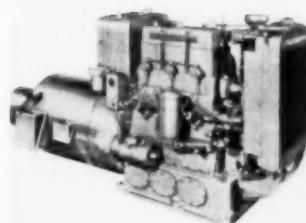


#### Magnetic Starters

(8)

New line-voltage type ac magnetic starters in sizes 0 and 1 have been announced. These starters are compactly designed and all parts are accessible from the front. Contact carrier and stationary contact blocks are molded of high arc-resistant melamine. Stationary and movable contact assemblies may be replaced without disassembling starter. Ilsco solderless terminals, suitable for No. 6 wire, are standard; screw terminals are available on special order. Overload relay features visible palladium-silver snap action contacts. Enclosed heater element, with expanding U-shaped bimetal and snap action contact mechanism, provides motor overload protection. Trip-free manual reset is standard, but manual/automatic reset is available on special order. On size 0 and 1 starters all parts, except stationary and movable contact assemblies, are interchangeable. Overload relays may be mounted separately.

*R-B-M Division of Essex Wire Corporation, Logansport, Ind.*



#### Generator

(10)

Announcement has been made of a new three cylinder Diesel engine, rated at 30 to 45 hp within a speed range of 1200 to 1800 rpm. Known as the 4FS3, it has a 4½-inch bore and 5½-inch stroke and is a four-cycle, vertical, mechanical injection Diesel engine. Built as a complete, self-contained, ready to operate unit, it is available as an electric generator set, pumping unit and with clutch or stub shaft power take-off for direct connection or belt drive. It is also available with heat exchanger cooling for marine auxiliary applications. It is available in direct or alternating current models from 20-30 kw in all standard voltages, 50 or 60 cycle. Unit generates light and power for large magnets, sand and gravel plants, saw mills, resorts and tourist courts, oil field rigs and other auxiliary equipment, etc., and for standby service for public buildings, airports, small manufacturers, etc.

*Nordberg Manufacturing Co., Milwaukee 7, Wis.*

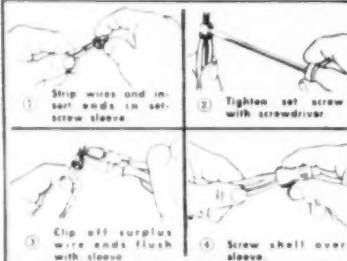
# Make Stronger, Safer Pigtail Splices!



## THE NEW IDEAL



PERMITS VISUAL INSPECTION  
OF JOINTS AT ANY TIME  
... Easy to Use...Safe



### WIRE CONNECTOR



Approved for 600 VOLTS  
AS PRESSURE CABLE CONNECTORS FOR GENERAL USE

With IDEAL Set-Screw Connectors you can make perfectly insulated, super-safe splices in branch circuit wiring, fixture hanging, machine and appliance hook-up—in just a few seconds per splice! They let you make changes in circuit layouts easily—just unscrew and re-use the same connectors! Or inspect joints at any time! Extra-long, extra-strong—IDEAL Set Screw Connectors offer you a new high safety factor that eliminates chance of flash-overs at higher voltages and insures against service failures. They are corrosion-resistant—shake-proof—pull-proof—built to be safe for a lifetime by IDEAL, for 27 years the contractor's first choice for precision-built, top-performance wire connectors. Try IDEAL Set-Screw Connectors on your very next job!



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1041 Park Avenue, Sycamore, Illinois

Please send us free samples and catalog information on the new IDEAL Set-Screw Connector.

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Two sizes, listed by Underwriters' Laboratories, Inc., for all common wire combinations



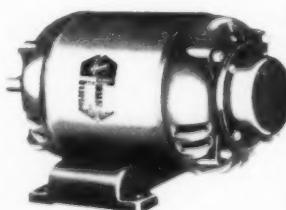
Sold Through  
America's Leading  
Distributors



Motor Control Center (11)

A new motor control center for use wherever two or more ac motors (up to 200 hp, 600 volts) are controlled from a central location has been announced. The new center was developed for use in power stations, public buildings, paper mills, chemical, petroleum, steel, rubber, ore, food, and other processing plants. It provides a simplified method of installing and servicing in a central location ac combination motor starters in NEMA sizes 1 through 5, as well as lighting panels and associated equipment for a group of motors. Center is designed to withstand short circuit stresses up to 25,000 amperes. One of the features is a four-in. vertical trough (with cable supports) which runs the full length of each section, providing ample space for wiring. Units may be installed from front or rear of section and are designed in even multiples of 14 enabling a variety of arrangements to be made and providing interchangeability.

General Electric Company, Schenectady 5, N. Y.



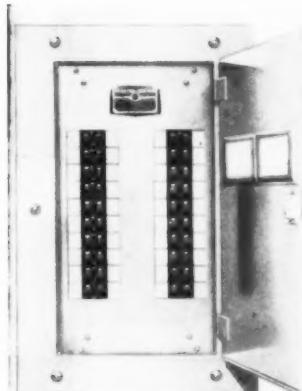
Motor

(12)

Announcement has been made that all future production of this line of integral horsepower, capacitor start motors will incorporate a design change. Capacitors no longer will be mounted on the exterior surface, instead, they will be housed within the mounting base. Motors ranging from  $\frac{1}{2}$  hp, 1140 rpm to 3 hp, 3450 rpm,

are built in standard NEMA frame sizes, equipped with heavy-duty ball bearings, and are suitable for continuous operation on general-purpose applications such as machine tools, pumps, farm equipment, fans, blowers, etc. A feature, which houses all parts of the centrifugal starting switch in an external dust-proof, dirt-proof chamber, prevents foreign matter from gumming the rotating actuator or lodging between the contact points.

*Kingston-Canley Division, The Hoover Company, 68 Brook Ave., North Plainfield, N. J.*



### Panelboards

(13)

Announcement has been made that the P2B and P3B pushmatic electric-center (circuit breaker) panelboards are now being featured under a new merchandising program, which makes lighting panels available for immediate delivery from the distributor's shelves. By stocking the basic devices, the distributor can meet customer specifications and provide a complete panel right over the counter. A basic device consists of cabinet, front and an interior which already contains either 4 or 6 pushmatic breakers. Customer states his preference for interior (single phase, 3 wire or three phase, 4 wire), type of front (flush or surface), and the number and type of additional individual pushmatic breakers. Five panelboards will cover hundreds of applications; factories, commercial buildings and institutions. Panels are available up to 42 circuits and are Underwriters approved. Individual units are rated 15, 20, 30, 40 and 50 amps. Units are quickly mounted and fully interchangeable.

*BullDog Electric Products Company, Detroit 32, Mich.*

# Safer... *all ways*



## Voltage Tester

### DOUBLE PROTECTION

Solenoid Voltage Indicator and a Neon Test Lamp Both Work Independently



### DOUBLE SAFETY

"No-Slip" Rings Protect Fingers from Touching Prods

### DOUBLE DEPENDABILITY

Top quality layer wound coil — "Fog Free" Crystal Plastic Window Keeps Out Dirt

Proved in the service of thousands of electrical men, IDEAL Voltage Testers give you the maximum in all-important safety features for all-round electrical testing! Solenoid indicator and test lamp are in parallel—even if the coil fails the lamp will still detect voltage. The coil itself is *layer-wound*—insures highest dependability and *will not heat up excessively*. The rugged plastic case has no uncovered "windows" to allow dirt to interfere

with accurate, sensitive operation. There is no exposed metal on the case that can cause shorts with live parts. Prods have heavily insulated handles with protective rings—no chance for fingers to slip and come into contact with the prods. The entire tester is light in weight, streamlined—easy to use and carry in your pocket. Your best buy for durable quality and *low cost*!

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**DRILL, CUT and CHIP  
10 TIMES  
FASTER**



**in CONCRETE  
and MASONRY  
with**

**SYNTRON**  
**ELECTRIC  
HAMMERS**



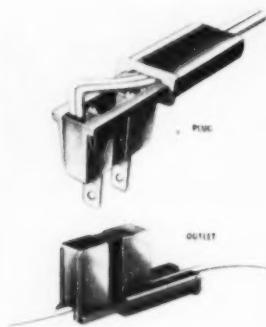
They'll save time and money on job after job—drilling anchor bolt holes in concrete and masonry, channelling and cutting holes through walls and floors for pipe and conduit, scaling rust and old paint.

There's no cams or gears—just 3600 powerful blows per minute of one working part—**THE PISTON!**

Operate from 110 volt or 220 volt A.C.

**Write for literature**

**SYNTRON COMPANY**  
Home City, Pa.  
1-90 Texan



**Electric Plugs (14)**

This new "slide-on" electric plug or outlet can be attached in five seconds to any standard No. 18 lamp or appliance parallel cord. Lay parallel wire in channel on top of moulded base and slide cap into place. This forces internal contact points to pierce insulation, making safe, positive connection. Outlets can be removed and attached elsewhere without exposing bare wire or damaging electrical cords.

*Gilbert Mfg. Co., Inc., 24-20-46th St., Long Island City 3, N. Y.*

and functions automatically when power fails. It illuminates 10,000 square feet for a period of nine hours or more. When power is re-established unit immediately starts to recharge automatically. It is produced in a portable steel case finished in grey hammertone. Two adjustable sealed beam lamps provide illumination. Also incorporated are test lights and switch and a charger light and switch. It can be used also for control of switchboards, valves, gauges and other devices. Comes ready to plug into any 110 volt, 60 cycle, ac circuit.

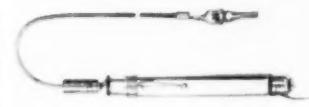
*Sentry-Lite Division, Hobby & Broken Electronic Corp., 55 Front St., Rockville Center, N. Y.*



**Plug Cup and Connector (17)**

Announcement has been made of the addition of Turnex, a new all-rubber locking plug cap and connector that is interchangeable with other standard locking caps and connectors. Construction is rugged, and practically indestructible with heavy-duty rubber cover; molded in cord grip for heavier portable cords; laminated phenolic inserts; extra heavy brass contacts. Made in 10 amp, 250 volts; 15 amp, 125 volts.

*Daniel Woodhead Co., 15 N. Jefferson St., Chicago, Ill.*



**Tester (15)**

A new pocket-size continuity tester has been added to this line. It is designed to determine continuity of circuits and identify wires between terminals or in multi-wire cable, as in switchboards and control panels. It permits testing of circuits without need of live wire connections, as it provides its own power from pen-like batteries. It uses a signal light indicator which illuminates the point of contact. Testers are equipped with a four-foot cord and alligator clip.

*Ideal Industries, Inc., 1041 Park Ave., Sycamore, Ill.*



**Range Cord (18)**

A new range cord, called Snapit, has been announced. It has all rubber construction; new design; moulded in hand grip; positive adjustable strain relief; rubber covered conductors; copper lugs; 36-inch cable length. It is listed with Underwriters' Laboratory, Inc. and is rated 50 amp, 250 volts, 2 No. 6 and 1 No. 8 conductors.

*Cable Electric Products, Inc., 234 Daboll Street, Providence 7, R. I.*

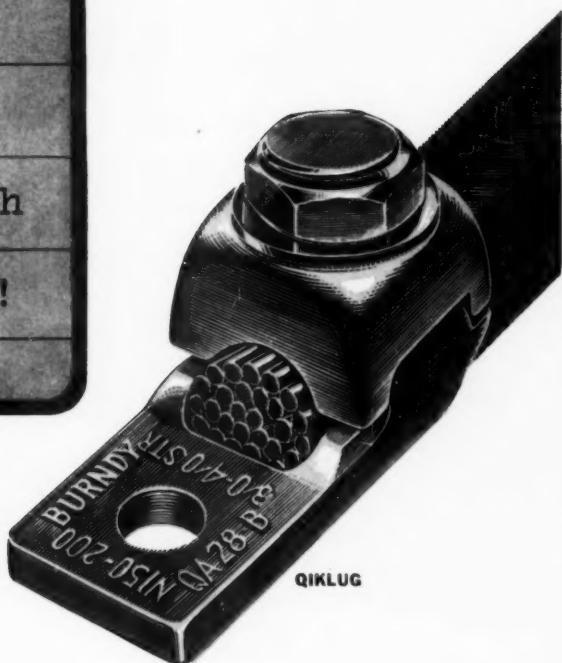
Contractors

Save Time,

Money, and

Materials with

Burndy Qiklug!



## re-used!

With material scarcities becoming critical, you'll appreciate the reusability feature of the Burndy Qiklug. Constructed of high-conductivity, corrosion-resistant alloys, Qiklugs are designed for durability...with clean, husky threading, so they can be used over and over.

And that's not all! Quickly installed with an ordinary wrench...compact for close quarters...they save time and labor costs. To answer the immediate problem of scarcities—to fill the long-range need for dependable, economical connections—no wonder more and more contractors call for Qiklugs!

There's a Burndy Connector for every application.  
Ask your Burndy distributor.

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PRODUCTS

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WIRING SPECIALTIES

## TOPS IN DESIGN

"Latrobe" Floor Boxes and Wiring Specialties are designed to do their job easily and surely with no excess parts. This same compactness of design makes for fast, easy installations.

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Fullman  
"LATROBE" PRODUCTS  
Supreme Quality



FULLMAN MANUFACTURING CO.  
LATROBE . . . PENNSYLVANIA



Fitting

(19)

A rigid-type solderless ground fitting for bonding 3/4 inch conduit to water pipe or driven ground rod is now available. It is an extra heavy, high strength clamp made of special bronze alloy of highest electrical conductivity. Fitting has a swivel conduit hub, adjustable to any position. Large clamping washer and design of conduit fitting provide protection for wire connection. Other features include a bottom section which is reversible for small rods, heavy bolts and lock washers, and a special slot which permits clamp to be opened for installation. It accommodates up to No. 4 stranded AWG wire, 3/4 inch conduit, and fits 1/2 inch to 1 inch water pipe as well as 3/4 inch to 1 inch diameter ground rods of any shape or material.

*H. B. Sherman Manufacturing Co.,  
Battle Creek, Mich.*



Soldering Iron

(20)

A new electric soldering iron, for use on fast production lines where speed is required from an iron with a small tip diameter has been announced. Iron is the plug tip type, rated at 150 watts, with a 1/4 inch diameter tip. Special provisions have been made in the element construction to withstand the high temperature developed. It is designated as Model P-154, and has replaceable elements and tips.

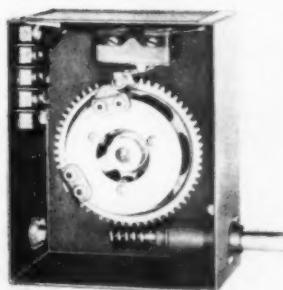
*Hexacon Electric Company, 258 W.  
Clay Ave., Roselle Park, N. J.*

**Industrial Heaters**

(21)

A complete line of combination portable and suspension type industrial heaters has been designed. They supply fan-circulated heat for factory rooms, offices, exposed areas, isolated buildings, watchman houses and any hard-to-heat areas. Units are available in 1500, 3000 and 5000 watt capacities, with manual or automatic temperature control. They may be plugged in temporarily wherever heat is required or may be mounted permanently on swivel-type hangar brackets. When controlled by thermostat, they hold room temperature within close limits, since heaters operate only long enough to bring room up to desired temperature, then shut off automatically. The heating element, called Safety-Grid, has no exposed hot wires or glowing coils. A thermal cutout prevents overheating.

*Electromode Corporation, 45 Crouch Street, Rochester 3, N. Y.*

**Limit Switch**

(22)

Announcement has been made of a new rotating limit switch designed to control the travel of any rotating device requiring interruption or establishment of electrical current after a predetermined number of revolutions. It is useful for machinery, lifts, automatic door operators, and other power equipment. Switch is in a finished case, 16 gauge, reinforced. Optional location of driving shaft makes it possible for its placement on either right or left side, by changing the position of the worm shaft assembly. Worm gear combination has a 60:1 ratio, sufficient for most industrial uses. Number of revolutions can still be increased by using various combinations of driving sprockets, either on shaft of switch, or on sprocket of unit controlled by switch itself.

*Crane Electric Company, 1437 West Lake St., Chicago 7, Ill.*

**DIM**  
**BRIGHTEN**  
**BLEND**

# Light

**WITH POWERSTAT DIMMING EQUIPMENT**

**A COMPLETE LINE TO SERVE EACH APPLICATION**

**1 NON-INTERLOCKING TYPES**  
available in manually-operated and motor-driven models in capacities from 1,000 to 30,000 watts.

**2 PACKAGED UNITS**  
compact facilities in one cabinet for dimming control. Offered in 6-1000 watt and 3, 4, 5, 6-2000 watt packages.

**3 INTERLOCKING TYPES**  
for large switchboard installations. 2000 and 5000 watt assemblies can be mastered and grand mastered.

**4 POSITIONER CONTROLS**  
a remote controller providing miniature selector station operation of non-interlocking motor-driven POWERSTAT dimmers.

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**THE SUPERIOR ELECTRIC CO.**   
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Please send literature on the following items of POWERSTAT Light Dimming Equipment.  1  2  3  4

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AT

Western Electric



EXPLODED  
VIEW  
OF  
JOINT



At Western Electric, Utica's Lubring line of pliers...with built-in lubrication...is used for a wide variety of in-plant and field jobs.

Utica's Lubring line of finest pliers has a ring of oil-impregnated porous iron floating in the joint...slowly feeding lubrication for smooth action, long life.

Drop forged, precision machined, with cutting edges hardened by a special Utica process, the Utica Lubring line has the heft, feel and rugged power for continuous daily use.

Your tool supplier can tell you more about Lubring and other Utica pliers...or write direct to

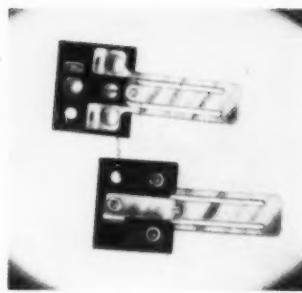
**UTICA Drop Forge & Tool Corp.**  
Utica 4, New York

In Canada:

Adams Tool & Supply Co., Ltd., Montreal  
Walis-Irons, Ltd., Winnipeg



AND THE WORLD'S BEST TOOLS ARE MADE IN U. S. A.



Switch

(23)

A thermal switch, Model SW-T-1, for remote on-off control of auxiliary electrical circuits has been announced. Switching operations in accessory circuits and appliances will function reliably without manual aid. This model eliminates special wiring and switching equipment. Design features include small, compact size, easy installation, rugged construction, fast self-recycling, pure silver-to-silver contact. Maximum load is 50 watts, actuating load minimum is 100 watts at 117 volts, actuating load maximum is 500 watts at 117 volts.

*LaPointe Plascomold Corp., Windsor Locks, Conn.*

bility through an arm which swings from side to side and extends outward. A counter-weight permits user to raise and lower fixture to desired height. The same is produced in the ceiling fixture by means of a reel concealed in a polished brass ball on the cord midway between the shade and the ceiling. The Lytecaster ceiling fixture group offers five different styles—four stationary, one which raises and lowers.

*Lightolier, Inc., 11 East 36th Street, New York, N. Y.*



Voltage Regulator

(25)

A new single-phase, 32-step voltage regulator with ratings that are suitable for branch and rural circuits has been announced. Designated as ML32, it supersedes the eight-step ML8. Regulator offers 10% raise and 10% lower regulation in 32, five-eighth percent steps. Designed to include all ratings covered by the ML8, the ML32 is available in voltage classes of 2500, 5000, and 7620 volts, with insulation levels designed for the corresponding "Y" voltages. Among other improvements a modified, rapid switching process has been incorporated. Controls are designed to meet ASA Class 1 standards, and are assembled on a new control panel, essentially the same as those used on large power transformers with load ratio control. A new magnetic position indicator is located on the tank for easy reading from the ground.

*General Electric Company, Pittsfield, Mass.*



Lighting Fixture

(24)

A new collection of wall and ceiling fixtures has been introduced. It includes mobile and stationary pin-up wall fixtures, mobile and stationary ceiling fixtures and stationary installed wall pieces. They are designed for use in home, store or showroom. Typical of the designs are two fixtures, one wall, one ceiling, with shades of natural Scandinavian Aspenslat poised against polished brass surfaces. Wall fixture is a pin-up and achieves mo-

Appliance Switch

(26)

Announcement has been made of a double-pole appliance switch, capable of withstanding intermittent temperatures up to 600°F and sustained temperatures up to 450°F. The positive snap-action mechanism is enclosed in a precision-molded box of electrical porcelain. Overall dimensions of box are 1 1/8 inches long, 1 1/8 inches wide, 1 1/8 inches high. Special phenolic-molded, heat-resistant material is used



2800-square-foot PLEXIGLAS luminous ceiling in Rohm & Haas Company Engineering Building, Bristol, Pa. Corrugated white translucent PLEXIGLAS is mounted wall-to-wall below continuous runs of fluorescent lamps. Upper window glazing is corrugated gray PLEXIGLAS, for prevention of sky glare.

## ENVIRONMENTAL LIGHTING . . . With a PLEXIGLAS Luminous Ceiling

For *environmental* room lighting, the whole field of view must be in brightness balance . . . as in this drafting room with its PLEXIGLAS luminous ceiling.

The surface brightnesses of the ceiling, the walls, and the window areas of this room are less than three times as bright as the paper on the drawing boards. Note how these surfaces produce a field of uniform brightness in which there are no eye-fatiguing light-to-dark contrasts.

An average illumination of 118 footcandles is provided through the PLEXIGLAS diffusing panels, without objectionable direct glare from the large-area ceiling surface.

PLEXIGLAS acrylic plastic offers other advantages as a diffusing medium. Because it is rigid, light in weight, and strong, PLEXIGLAS can be handled easily and safely during installation, cleaning, and relamping operations. And because it is highly resistant to breakage and discoloration, it gives long, low-maintenance service.

If you have a lighting problem, investigate *environmental* lighting with a PLEXIGLAS luminous ceiling. We'll be glad to send you full technical details about the installation shown above. Write for them.

CHEMICALS  FOR INDUSTRY

**ROHM & HAAS**  
**COMPANY**

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*Representatives in principal foreign countries*

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# QUALITY

Nothing succeeds like success—and the formula for the latter remains unchanged. The combination of a good product with genuine interest in the customers' side of the transaction has necessitated the completion of our third and largest expansion move within the past 5 years. What better recognition of the "Mark of Quality"!

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**MARCUS**  
DRY TYPE  
Transformers

ONE OF THE WORLD'S LARGEST MANUFACTURERS OF DRY TYPE TRANSFORMERS EXCLUSIVELY.

1 to 2,000 KVA up to 15,000 Volts to meet individual Requirements

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**MARCUS TRANSFORMER CO.**



General purpose transformers,  
600 volts and below; 1-15 KVA  
inclusive, single or three phase.



450 KVA, Type F Unit Substation,  
4160 V. Delta, 60 Cycles, 3 Ø—  
120/208Y, 4 wire.

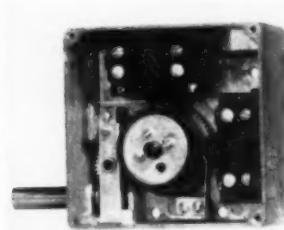
for breaker bars. Electrical porcelain barrier separates terminals. Special face plates for mounting can be furnished. Unit bears approval of Underwriters' Laboratories, Inc.

John L. Paulding, Inc., New Bedford, Mass.

## Fluorescent Cabinet (27)

Announcement has been made of a new fluorescent bathroom cabinet, with recessed lighting. Unit is flush with the wall and gives glareless, shadowless illumination, diffused evenly, and where it is needed. It uses four 20 watt fluorescent lamps, shielded with Corning Alba-lite translucent opal glass. Built of 20 gauge cold-rolled steel. Mitered corner, filled and polished. Double-baked white enamel finish. Mirror of mirror-glazing quality polished plate glass. Polished edge glass shelves. Approved by Underwriters Laboratories. Rated 110-120 volts, 60 cycle ac.

Northern Light Company, 2051 N.  
19th Street, Milwaukee 5, Wisc.

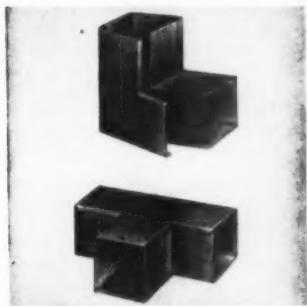


## Limit Switch (28)

A new rotating-type limit switch for application where reversing operation is to be coordinated with the number of revolutions of a motor shaft or driven equipment has been announced. Superseding four previous forms, the new switch can be used to control motor-operated doors and windows, valves on machine tools, baling operations, travel limits on machinery, etc. Switch consists of two size 2 switchettes each having one normally open and one normally closed circuit. Units are operated independently by cams rotated through a worm and gear reduction from a shaft extending outside case. It can be adjusted to operate from 4 to 110 turns of driving shaft with 5 turns overtravel in either direction. All parts are accessible for installation, adjustment, and maintenance. Standard form of switch is housed in zinc die-

cast case with removable cover, and measures approximately four inches square and two inches deep. Also available are water-tight and explosion-proof forms in cast-iron cases.

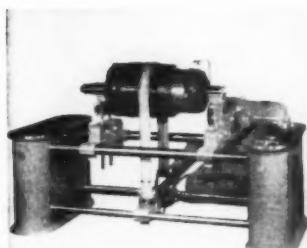
General Electric Company, Schenectady 5, N. Y.



Fittings (29)

Flangeless type 90° elbow and tee fittings have been added to this line. Designed to permit added flexibility in meeting wiring layout requirements, the new fittings are available in two sizes to fit either 4-inch or 6-inch square wireways. They are brake formed from heavy gauge steel, painted for corrosion resistance, with edges precision formed for easy assembly with the wireways. They have U. L. approval.

Keystone Manufacturing Co., 23328 Sherwood Ave., Center Line, Mich.



Balancing Machine (30)

The new Raydyne dynamic balancing machine measures static, dynamic and total unbalance. Universal V-type bearings take all shaft sizes. V-type bearings are adjustable to accommodate work pieces with different diameter journals on opposite ends. Work supports are mounted on ball bearings to give freedom of movement in any direction. Endless belt drive assures smooth operation of work piece at any



### Lower your lights for lower maintenance costs

Using two men and a crane to maintain overhead lights is like sending two men and a tractor to carry a wrench. For efficient servicing of high-bay lights, there is no faster, safer means than THOMPSON disconnecting and lowering hangers!

Lighting maintenance costs come down with the lights, and new safety records are set by service crews when THOMPSON hangers are installed. Simple manual control is exercised from floor level.

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desired speed. Unit indicates all forms of imbalance. Electronic stroboscope picks out position and meter indicates value of imbalance in each of two correction planes. Machines are available in a wide range of sizes.

Welch Manufacturing Co., 920 W.  
Laurel St., Springfield, Ill.

## Washing Equipment (31)

Announcement has been made of new line insulator washing equipment for power distribution systems. Equipment consists of steel water tank, available in 200, 350 and 500 gallon capacities, welded to channel and/or I beam for mounting in truck chassis. Water pump is centrifugal, mounted on tank type, with gasoline driven engine. Wood boom about 20-24 feet long supports hose. Nozzle is of special fluted design to give instantaneous solid jet acting stream. Hose is high pressure type. Stanchion permits boom to swivel in circle and elevate to proper angle, about 3 feet high. Guard rail is 3 feet high.

Preakness Incorporated, 972 Broad St., Newark 2, N. J.

## Product Briefs

(32) General Electric Company, Syracuse, N. Y. has developed a new power rectifier for television receivers, radios and military electronic equipment.

(33) Linemen are now using laminated plastic protective hats for pole-top, surface and underground work. They are manufactured by Mine Safety Appliances Company, Pittsburgh, Pa. (34) A new, portable, magnetic base light, which holds up to 100 watt standard bulb has been introduced by the Enco Manufacturing Co., 4524 W. Fullerton Ave., Chicago 39, Ill.

(35) Milwaukee Electric Tool Corp., 5316 West State St., Milwaukee 8, Wis., has announced a new line of "Super" hole shooter.

(36) Flex-flyte, a new durable and flexible ducting for the air conditioning and ventilating industries is being produced by the Flexible Tubing Corporation, Guilford, Conn. (37) General Scientific Equipment Co., 2700 W. Huntingdon St., Philadelphia 32, Pa., has introduced a new automatic emergency light. Unit is self-contained, portable, can be carried for rescue or emergency work.

(38) A new four lamp infrared brooder with thermostatic control has been announced by Steber Manufacturing Company, Broadview, Ill.

## CATALOGS and BULLETINS

(39) FANS AND BLOWERS catalog contains 24-pages illustrating and describing a wide range of ventilating fans, air circulators, belt driven exhaust fans, floor and window fans, spray booth fans and industrial type volume blowers, with complete specifications on all units. Standard Electric Mfg. Co., West Berlin, N. J.

(40) INDUSTRIAL INSTRUMENTS catalog No. 5000 illustrates and describes in 28-pages recording potentiometers, thermometers, thermocouples, panelboards and related instruments, switches, starters, contactors, relays and other recording instruments, with complete specification. Brown Instruments Div., Station 40, Minneapolis-Honeywell Regulator Co., Wayne and Windrim Aves., Philadelphia 44, Pa.

(41) PLUGS AND RECEPTACLES for high cycle industrial tools and portable electrical equipment and for use with detachable power, lighting, remote control, instrumentation and communication circuits, are described and illustrated in 2-color bulletin No. 603, listing sizes and styles from 1 to 8 poles with ratings from 0.2 amps, 600 vdc to 60 amps, 250 vac. The Pyle-National Co., 1334 N. Kostner Ave., Chicago 51, Ill.

(42) METER SOCKET SELECTOR is an 18-page booklet providing quick selection of proper type meter socket based only on type of service desired and wire size to be used, with detailed and indexed information on each type and information on circuit closing provision, terminals, service disconnects, reference wiring diagrams and ordering information. Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa.

(43) REWIRING to add capacity to overloaded electrical systems, using existing conduit, is the subject of 11-page booklet "Rx for a Building with Hardening of the Arteries", illustrating and describing the application of type AVA high current capacity cable, with tabulated and graphed data on its selection and use. Rockbestos Products Corp., New Haven 4, Conn.

(44) INDUSTRIAL LIGHTING is the subject of a series of five 8-page booklets illustrating and describing many industrial lighting installations with



*John Hancock*

took out insurance  
against wiring troubles

... with 70 miles of

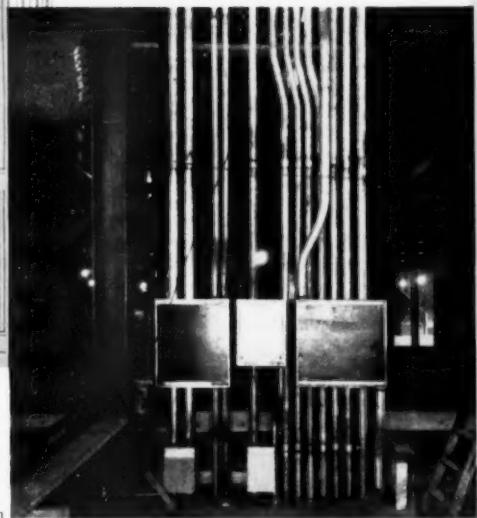
## SPANG "CENLACO" CONDUIT

Boston's most modern skyscraper is the home of the John Hancock Mutual Life Insurance Company—and an outstanding example of good electrical planning.

Throughout the entire 26 stories there are innumerable, ingenious electrical design features that insure the extra continuity of service and the extra safety to personnel stipulated by the owner. Which makes the 100% use of Spang "Cenlaco" Conduit, from 500,000 CM secondary feeders to circuit runouts, particularly significant.

It's additional evidence of the reliance that prominent owners, contractors and architects place on the uniformity and dependability of quality-controlled Spang "Cenlaco" Conduit.

If you need conduit for any purpose, be sure and specify Spang "Cenlaco", "Central Black", "Central White" or "Central EMT". You'll like the consistent high quality—and the ease with which these better conduits can be cut, threaded, bent.



**OWNER:** John Hancock Mutual Life Insurance Co., Boston

**ARCHITECTS:** Cram & Ferguson, Boston

**ENGINEERS:** Nixon Electric Company, Boston

**GENERAL CONTRACTORS:** Turner Construction Company, Boston & New York

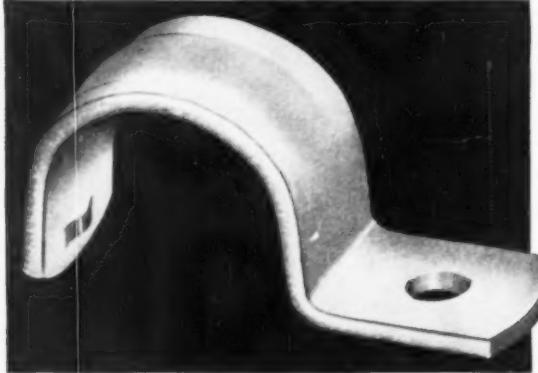


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for rigid and thinwall conduit

Patent Pending



Exclusive self-holding feature saves time, eliminates fumbling and dropping, makes difficult installations easier.

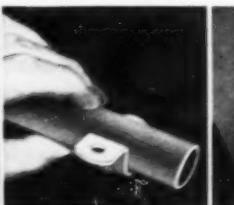
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Extrance Cable Fittings • Fluorescent Ballasts • Staples  
 Conduit and Cable Straps • Floor Lights • Box Supports  
 Connectors • Wire Holders • Locknuts and Bushings  
 Sill Plates • Conduct Extrance Caps

tabulated design and operating data, information on maintenance equipment and testing set-ups, description of special lighting units and complete theoretical and technical analysis of all elements of industrial installations. General Electric Co., Inquiry Bureau, Nela Park, Cleveland 12, Ohio.

(45) **WIRING DEVICES** catalog contains 96 pages listing over 1000 items for industrial, commercial and residential use, with specifications, dimensions and application wiring diagrams. Leviton Mfg. Co., Brooklyn 22, N. Y.

(46) **DEV EYER TRANSFORMERS** openly ventilated, with Class B insulation are discussed in 8 page bulletin 61X7098B, containing the illustrated proposed AIEE guide for their operation and maintenance, and recommendations on the installation, inspection, storage and operation of units in ratings above 50 kva and above 600 volts, cooled by natural or forced draft. Allis-Chalmers Mfg. Co., 930 S. 20th St., Milwaukee, Wis.

(47) **CONTROL CENTERS** NFPA 70-1 through 5 starter units, for all industries where two or more ac motors are controlled from a central location, is illustrated and described in 23 page bulletin listing construction details, installation and operation data, electrical and mechanical specifications and control center planning and selection procedure. General Electric Co., Schenectady 5, N. Y.

(48) **INDUSTRIAL UNIT HEATERS** catalog EC-62R gives complete descriptions, specifications and illustrations of suspension type, combination portable and suspension and explosion-proof heaters, including data on control equipment, mounting and wiring. Electromate Corp., 45 French St., Rochester 3, N. Y.

(49) **INDUSTRIAL HEATERS** are available in cooled and radiant cooled units, in ratings of from 250 to 25,000 watts in gasoline models, and from 2,500 to 6,000 watts in diesel plants. Are priced and listed with operating data in form E.I. 3. Universal Motor Co., 438 Commercial Drive, Quakertown, Pa.

(50) **Insulating Materials and Their Application to Insulating Cables and Armatures** are described in 8 page illustrated bulletin CIC-15, including properties, uses and specifications of insulation, glass, aluminized glass, insulating foams, varnished cloths and tapes, sealing and filling compounds and various insulating materials. General Electric Co., Chemical Div., Pittsfield, Mass.

(51) GROUNDING CONNECTOR, a two piece compression type connector for terminating and grounding braided shields on wire and cable used in shielded conductor applications, is described and illustrated on data sheets, including manual and power tools and method of installation. The Thomas & Betts Co., Inc., 34 Butler St., Elizabeth, N. J.

(52) MOTORS, high torque, constant speed single phase and normal torque, constant and two speed polyphase, are illustrated, priced and described with electrical and mechanical specifications in 8-page bulletin. Triad Engineering Corp., 450 East Ohio St., Chicago 11, Ill.

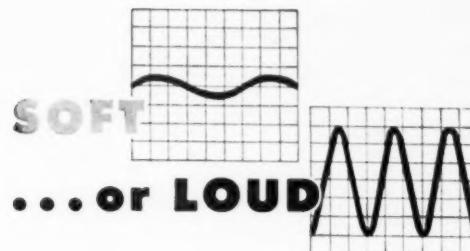
(53) CAPACITORS for electronic equipment are illustrated and described with technical specifications and dimensions in 28-page catalog, including ceramic capacitors, electrolytic capacitors, mica and paper capacitors, capacitor test equipment, interference filters and converters. Cornell-Dubilier, 333 Hamilton Blvd., South Plainfield, N. J.

(54) SPACE HEATER catalog, EC-63-R, describes and illustrates typical installations for wall type, portable, automatic and non-automatic heaters, with complete specifications and suggested uses. Electromode Corp., 45 Crouch St., Rochester 3, N. Y.

(55) FLOURESCENT MERCURY LAMP, JH-1, is the subject of 4-page booklet providing complete physical description of this "Golden White" light source, application recommendations, comparison with other sources, tabulated technical and transformer data and diagrams and data on luminaires designed for the JH-1. Westinghouse Electric Corp., Lamp Div., Bloomfield, N. J.

(56) DC POWER SOURCES, electronically regulated to 0.1% at 6, 12, 28, 125 and 200 volts, and at currents of 5 to 350 amperes, are illustrated and described in catalog giving specifications, application and circuit theory on models with outputs of up to 1000 vdc at 0-500 ma and continuously variable outputs of 3-30, 3-135 and 100-300 vdc. Sorensen & Co., Inc., 375 Fairfield Ave., Stamford, Conn.

(57) WHITEPRINTING OUTFITS for directly reproducing drawn, typed, printed or written material from a one-sided translucent original are described and illustrated with directions for using the printer and chemicals in copying diagrams, reports, records, etc., in 4-page folder. Peck & Harvey, 5736 N. Western Ave., Chicago 45, Ill.



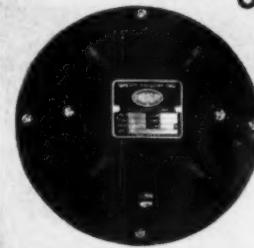
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The noisy part of the plant responds to the air blast signal of Faraday

Kodaire. Where sound levels are high or varied, it commands attention with a high powered trumpet blast—perfect for mills, foundries, industrial plants, either inside or outside. Try it on your next new or replacement job.



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BELLS • BUZZERS • HORNS • CHIMES • VISUAL AND AUDIBLE PAGING DEVICES AND SYSTEMS



Here is a simplified, integral light and sound conditioning system with amazingly low initial cost, installation cost, and maintenance cost!

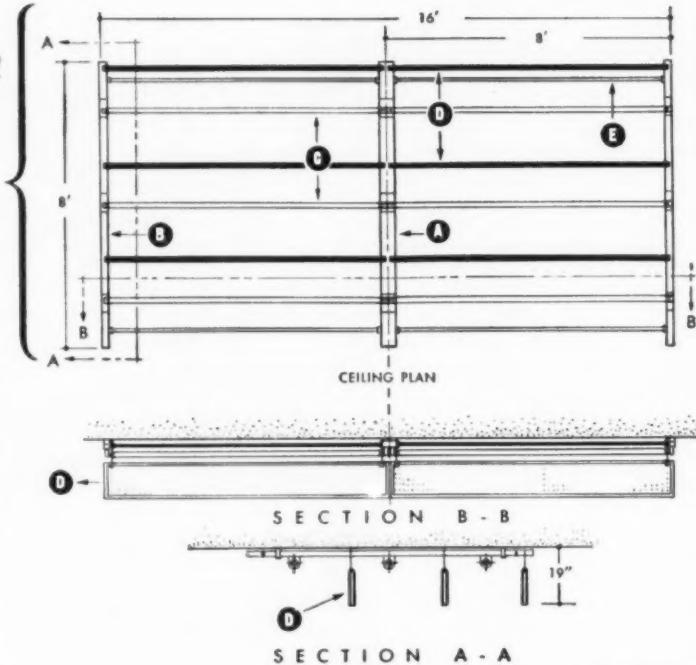
Ideal for schools, offices, auditoriums, stores and other commercial interiors.



This 8" x 12" x 96" packaged section, completely wired and assembled, expands to cover an area of 128 square feet as shown on ceiling plan at right. Sections may be mounted end to end and side by side to accommodate all room sizes.

- A** Mogul CurtiStrip rolled steel channel houses ballasts, wiring, and supports high voltage lamp holders.
- B** Smaller CurtiStrip rolled steel channel supports low voltage lamp holders.
- C** 96", T-12, 72-watt Slimline lamps. May be operated at half-brightness or normal brightness.
- D** 1" x 8" perforated acoustical panels (both sides perforated) in rolled steel frames.
- E** Interconnecting lengths of 1/2-inch tubing. Splices channels and encloses wiring.

Photograph shows the Curtis Light and Sound Conditioning System with portion of the panels installed. Hinsdale Township High School, Hinsdale, Illinois.



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cable splicing materials  
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Time*

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**there is a quicker, simpler, better  
way to order these materials**



**THE G & W SPLICING KIT  
is the TIME SAVING WAY**

**SIMPLY** give us complete cable data and you receive a neat package with adequate quantities of all materials for a properly designed joint.

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and money because...*

No lengthy material specifications are necessary. Both design and installation methods can be standardized. All joints are properly designed to industry standards by expert cable engineers. Each kit packed in convenient size box. Easy to store, identify and handle. Individual kits issued directly to workmen in original shipping cartons. Easy to quickly estimate costs for any particular job.

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COMPLETE CABLE DATA**

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connections tight. Contacts should be checked frequently for alignment, contact pressure, and burning. Sandpaper and files should be used sparingly—heavy canvas will usually keep them clean. Never use oil on a controller unless directed by the manufacturer.

The manufacturer's instruction manuals are the best source of maintenance information.—D.H.N.

tained. The capacitor in microfarads can be determined by the following:

$$\begin{aligned} \text{Microfarads} &= 2650 \times \text{Amperes} \\ &\quad \text{Applied Voltage} \\ \text{Power Factor} &= \text{Watts} \text{ (Measured by} \\ &\quad \text{Watthour Meter)} \\ &\quad \text{Apparent Watts} \\ &\quad (\text{Volts} \times \text{Amps}) \end{aligned}$$

If desired, the power factor may be computed: 5% or 6% is normal, and a maximum of 10% is permissible.

These readings should be taken as quickly as possible, for electrolytic capacitors are intermittently rated. Below is table.

**Ratings of Electrolytic Capacitor**

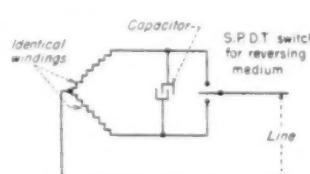
Nominal Rating Microfarads	Limits Microfarads	Amp. at 110 Volts, 60 Cycles	Approximate Max. Watts Based on 10% Power Factor
50	53-60	2.20-2.49	27
60	64-72	2.65-2.99	33
65	70-78	2.90-3.24	36
70	75-84	3.11-3.48	38
90	97-104	4.03-4.45	49
100	108-120	4.49-5.0	55
135	145-162	6.0-6.7	74
115	124-138	5.15-5.75	63
150	161-180	6.7-7.45	82
200	216-240	8.95-10.0	109

—O.C.

**Constant Current Transformer**

QUESTION V19—*Could some one give circuit details of an economical way in which I can maintain constant a 110 volt ac supply within plus or minus two volts across a load which takes about 20 amperes? The voltage supply that I am to use varies from about 108 volts to about a high of 120 volts over a 24 hour period and I would like to keep it constant at a value of 110 volts across my load.*—E.J.K.

ANSWER TO V19—Any one of the several reputable transformer manufacturers will be quite capable of supplying your needs in a constant current transformer meeting stated needs. We use them constantly for power supplies to spectrometers and other instrumentation studies and calibrations.—F.C.Z.



Inasmuch as either winding acts as a main winding, depending upon the desired direction of rotation, it follows that both windings must be identical, both as a wire size and number of effective turns. If the motor is to develop the same torque in either direction of rotation.

Apply service to your motor, if a readable value of current input is ob-

**Removing Solder from  
Fluorescent Bulbs**

QUESTION U19—*What is an easy way of removing the excess solder from fluorescent bulb tips? This excess solder breaks the sockets.*—H.S.

There is a difference  
in fluorescent lamps



This is one . . . found in G-E lamps, of course!



THE ends of these fluorescent lamps are aluminum. Rough handling doesn't crack them. Cold can't shrink them enough to make them crack the glass tube. They can be heated hot enough to make a tighter seal. They eliminate one reason why fluorescent lamps sometimes fail before they should. They're on G-E lamps, of course. This is one of many basic differences that make General Electric your customers' best buy in fluorescent lamps.

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**GENERAL**  **ELECTRIC**



**Best in Design**  
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**Best in Engineering**  
**Best in Economy**

For Sports, Airport, Service Station,  
 Street, Outdoor Theatre, Marine  
 and Industrial  
 Lighting.



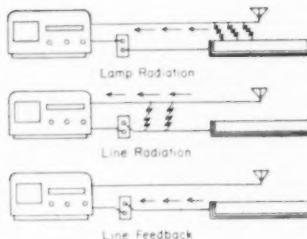
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**REVERE ELECTRIC MFG. CO.**

6017 BROADWAY • CHICAGO 40, ILL.  
 LIGHTING EQUIPMENT FOR EVERY NEED

ANSWER TO U19—In my experience with a large number of lamps, I find that if you have an electric iron you can drill two holes through the copper tip of the iron, of equal distance of the fluorescent lamp. The holes can be a trifle larger than the pins and not too deep. When the iron is hot enough to melt, the fluorescent lamp pins are placed within the holes and when taken out you will find that the solder will come off the pins, but may need a little wiping off with a rag. If the solder does not come out clean, then fill the holes on the iron tip with solder and a little flux. When dipped they will come out with clean fluorescent lamp tips.

The reason I suggest two holes drilled on the soldering iron tip is so that the holes when filled with solder act as a pot of solder when in use.—O.C.



connected across the supply lines as they enter the fixture. In most cases, these filters will reduce radio interference caused by fluorescent lamps to a level not detectable by the ear. A filter should be installed on each fixture, and as close to the lamps as possible.—F.D.L.

### AC Reactor

QUESTION X19—*Could someone give me the required design data, to design an ac reactor, for starting a 100 hp, type CCL, Westinghouse squirrel cage induction motor, 220 volts, 215 amps, 580 rpm? The starting load requires about 85% of the line voltage?*—L.H.M.

ANSWER TO X19—You will need a 3 phase, 220 volt primary, 187 volt, 300 amp secondary autotransformer, and a 6 pole double throw 400 amp switch. The motor and line leads are connected in the center, the autotransformer leads on the starting end, or you can get a factory assembled compensator.—H.S.

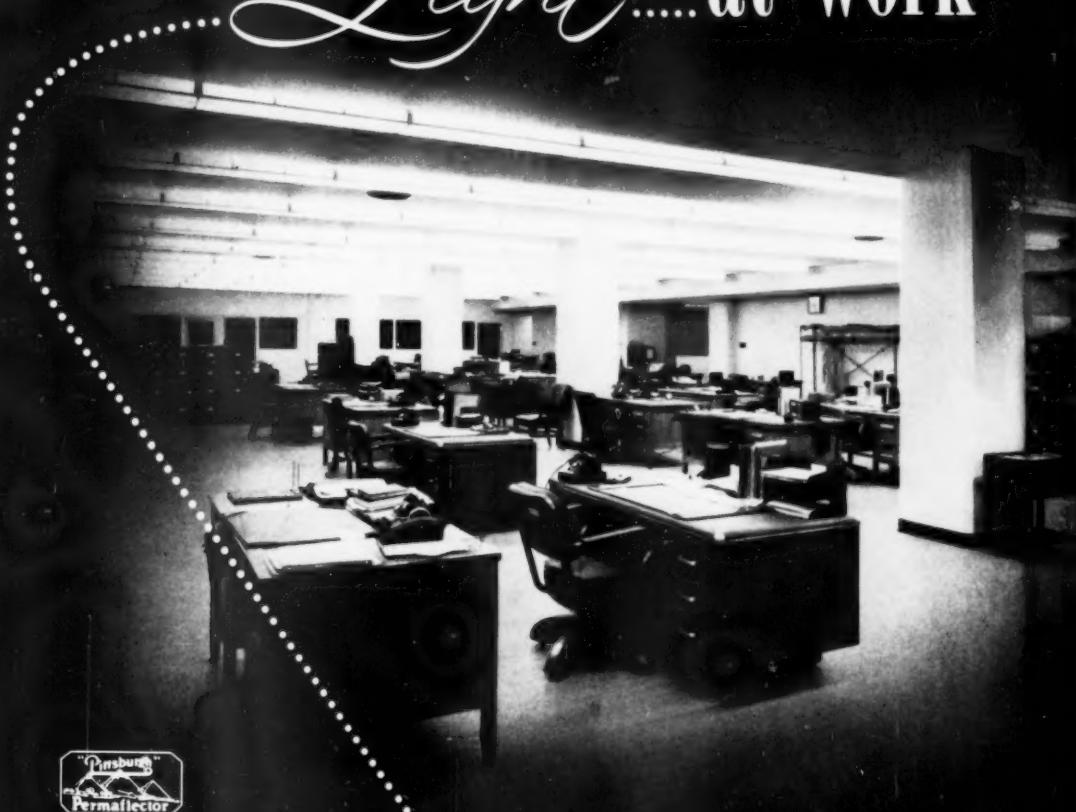
### Lamp Flicker

QUESTION Y19—*What circuit would I have to use to get a portable 100 watt lamp for a 25 cycle 120 volt circuit so that the light will not flicker?*—H.S.

ANSWER TO Y19—At 25 cycle 120 volts, a 100 watt lamp will flicker. To eliminate this you could use the proper step down transformer to 6 volts and use the same voltage bulb, with good results. The filament in the low voltage bulb is not affected by the low cycle.—E.S.H.

ANSWER TO Y19—The solution is to increase the frequency or change it to direct current. For a 100 watt load at 120 volts probably your best answer would be to use a selenium rectifier of this rating. The frequency could, of course, be increased by a small mo-

# Light.....at work



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The Levinson Steel Co.

Pittsburgh, Pa.

Elkan A. Avner, Architect  
D. Levinson, Elec. Contr.

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is "standard equipment" in offices, public buildings, and plants throughout the country. Pittsburgh Permaflector Fluorescent and Incandescent Units, or a combination of both, are designed to create exactly the illuminating results required for high level working efficiency and visual and manual acuity.

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It's the picture story of how  
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Powerful Milwaukee HOLE-SHOOTER combines straight and right-angle drilling... wonder-tool for close quarters

Built for use by electrical contractors and plant maintenance electricians, this Milwaukee  $\frac{1}{2}$ " HOLE SHOOTER — America's first 3-speed Right-Angle Drill — has demonstrated its unmatched time-saving performance on thousands of jobs. Most powerful drill built for its size and 9 lb. weight. Ball and roller bearing equipped for extra-long service life.

You'll be amazed at its versatility — unit-built for quick change to suitable speeds for drilling in wood, metal, masonry, concrete, tile. Uses wood bits up to 3" . . . also  $\frac{1}{2}$ " carbide-tipped drills.



Head swivels full 360°. Locks in any position.  
S-412 Drill with "2 speed Right Angle Drive" \$74.00



For straight drilling, S-412  $\frac{1}{2}$ " HOLE SHOOTER (above) has a chuck speed of 450 R.P.M. With the 2-speed "Right Angle Drive" attachment speeds are 300 R.P.M. or 675 R.P.M.



Other bits available also — We can supply you with any size wood-boring bits up to 3". Write us.

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- 1 — S-412  $\frac{1}{2}$ " HOLE SHOOTER Jacobs geared chuck.
- 2 — \*Two-speed "Right Angle Drive" attachment.
- 3 — 3 special bits —  $\frac{3}{4}$ ",  $1\frac{1}{8}$ ",  $2\frac{1}{8}$ ".
- 4 — Special wrench.

\*Pat. Pending

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KIT \$88.75



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tor-generator set, frequency changer, or by electronic means. However, all of these would be more expensive.—R.J.S.

## Can you ANSWER these QUESTIONS?

**QUESTION K20** — A transformer bank composed of three 333 kva transformers is hooked delta-delta. The primary side is fed by a three phase, 2400 volt line; the secondary is 480 volts and has a balanced three phase load. The impedance is 3.05 on all transformers. There is a circulating current at no-load of 42 amperes. Does this mean that there is a circulating current at all loads from no-load to full load? Is there any way of stopping this circulating current? —M.D.

**QUESTION L20** — Why could not a governor be used on an electric motor for speed regulations? —E.S.H.

**QUESTION M20** — In a discussion one day the term circuit breaker was brought up, and its meaning was debated. My question is "would you classify any disconnecting device with a thermal overload protecting feature as a circuit breaker? If not, what is a circuit breaker? —W.R.B.

**QUESTION N20** — We have a 50 hp, 3 phase, 2300 volt, 900 rpm induction motor that we should like to use on 440 volts at the same speed. Would it be practical to do so and what changes would be required? —W.P.R.

**QUESTION P20** — Why do you get a voltage reading from any one phase to ground on an ungrounded 3 phase system?

And using 550 volt-3 phase ungrounded system as an example—why do you get various readings to ground in different buildings? (For example —In one factory you will get a reading from any one phase to ground of 360 volts. In some other factory you may get a voltage reading of 330 volts from any one of the 3 phases to ground. Why the difference? —A.R.

PLEASE SEND IN  
YOUR ANSWER BY MARCH 15

# AND COOLSPOT FANS

in your inventory

**ARE LIKE MONEY IN THE BANK!**

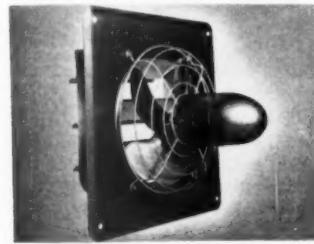


With production of electrical appliances cut 55% below pre-Korean War levels as of April 1 . . . and a hot summer coming up, Signal and Coolspot Fans will be more than ever in demand as the ultimate in attractive, functional design and *quality* workmanship. Prepare now to cash in on increased consumer demand—put more profit in your pocket with this complete line of portable and vent fans!

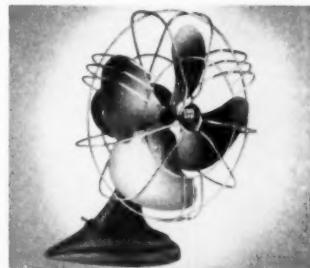
**LOOK, IT'S NEW! 5 Year Guarantee for all desk, pedestal, floor and window fans! Vent and exhaust fans 1 Year Guarantee.**



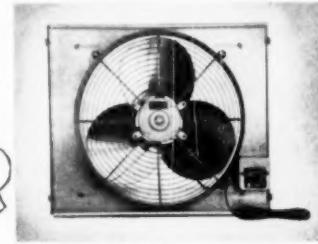
**MODEL 1649** 60 cycle, 3-speed 16" oscillator fan. quietly delivers 1250 C.F.M.; oscillates 80 degrees, locks in any position; opalescent Windsor green finish and brightly polished guard for quick sales-appeal. Also available in 12" (Model 1249) and 10" (Model 1049).



**V-700 SERIES** Completely assembled Shutter Attached Fans ready for trouble-free installation! Just match to a wall-opening from the inside, attach to wall with four bolts—and, the job's done! In 16", 12", 10" and 8" models, this fan delivers from 500 to 1600 C.F.M. depending on size. 60 cycle, single-speed motor is rubber-mounted for low noise level, high output. Assembled weight is 10 lbs. for 16" model. All aluminum, belted blades are replaceable, prevent motor overloading caused by wind pressure. Finish is durable hammered gray enamel; light weight permits use on thin wall construction.



**MODEL 562** 10" single-speed oscillator fan operates on 60 cycle, delivers 700 C.F.M. This streamlined, handy-sized fan is finished in attractive blue-gray enamel; oscillates 80 degrees, locks in any position.

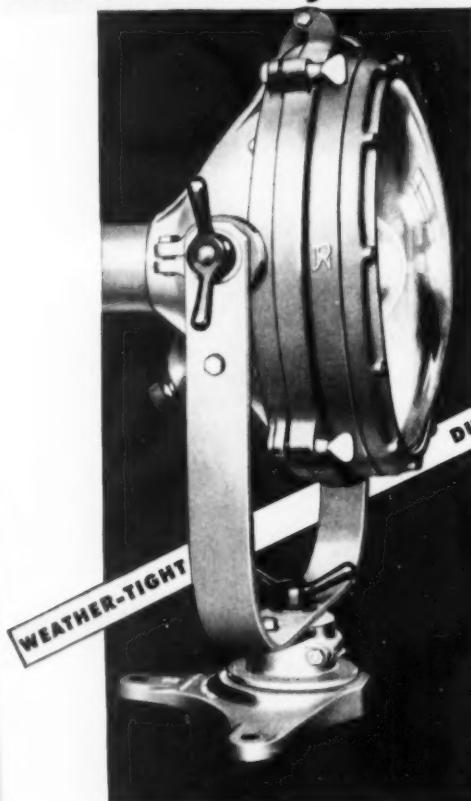


**MODEL WR-202** Sensational development in window fans, this new model with 20" blade is designed to deliver maximum air flow at low noise level! 50-60 cycle 2-speed capacitor motor is instantly reversible, non-radio interfering. Side panels telescope to fit any window; fan delivers 3800 C.F.M. in exhaust position, slightly less on intake. Beautiful ivory baked enamel finish makes it a compliment to any room.

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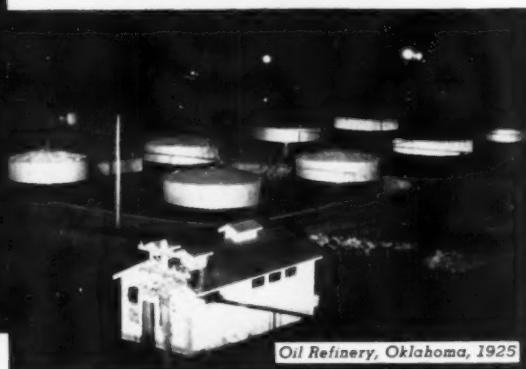
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# Questions on the Code

Answered by

**B. A. McDONALD**, Chief Inspector, New York Board of Fire Underwriters, Rochester, N. Y.

**GLENN ROWELL**, Electrical Engineer, Fire Underwriters Inspection Bureau, Minneapolis, Minn.

**B. Z. SEGALL**, Executive Vice President and Chief Engineer, Best Electric Co., Inc., New Orleans, La.

**F. N. M. SQUIRES**, Chief Inspector, New York Board of Fire Underwriters, New York, N. Y.

## Conductors in Wireway

**Q.** Several years ago we made an installation in which we used approximately 70 feet of wireway of 4 by 6 inch size in which were located 12 conductors carrying current for four 3 phase motors of rather large capacity. These conductor sizes were determined by using Table 1 of the National Electrical Code and in each case the motor rated amperage for full running current was well within the values specified in Table 1. We recently were called back to this plant because of the odor of smoke which was traced to this wireway and upon investigating, found that the Type RH insulation employed on these conductors was very badly cooked and while no actual fault had occurred, it is quite apparent one would occur within a reasonably short length of time if the conductors in place were not changed. In figuring copper for the replacement conductors, will the Code require that we use any correction factor because of the number of conductors placed within this wireway?—J.S.

**A.** Section 3624 of the National Electrical Code has a fine print note following the section which actually states that correction factors specified in Note 4 of Table 1, of Chapter 10 are not to be applicable in determining the conductor size to be used. I personally feel this is in error as there are numerous instances such as the one you mention where conductors have overheated and in some cases actually caused fires due to their inability to dissipate heat generated by the flow of current. Wireways in which the conductors can be separated have not, to my knowledge, been the source of any trouble. However, inasmuch as most wireways have all conductors bunched together at the bottom, it seems quite obvious that inasmuch as they lie next to each other, the surface left from which they may radiate their generated heat is greatly reduced especially for those in the center of the bundle making it,

I believe, essential that a design engineer or contractor use a definite correction factor in determining the safe carrying capacity for such conductors. Possibly it is not necessary to use as great a factor as is specified in Note 4 following Table 1 of the National Electrical Code as only a series of actual tests would determine whether or not that great a reduction in carrying capacity is necessary. However, if separation of the conductors within the wireway is not practical, I would certainly recommend the use of a generous percentage of the correction factors shown in this note in determining a reasonable carrying capacity for copper or the aluminum conductors you may use in the future under such conditions.—G.R.

## Hazardous Locations

**Q.** Have you any data or information as to requirements for operating rooms in regard to explosion-proof wiring? Also, the same information in regards to sewer disposal plants.—C.M.A.

**A.** The last fine print note of Code Section 5004-a refers us to the standard of the National Fire Protection Association for protection against the hazards common to hospital operating rooms. The standard is known as NFPA No. 56. Address your request to the National Fire Protection Association, 60 Batterymarch Street, Boston 10, Mass. Cost \$25. This standard represents years of study and experience with hospital operating room hazards by people familiar with such hazards. It deserves the whole-hearted support of all of us who are interested in electrical safety.

The fact that the Code does not include in its "index to related NFPA standards" any standard covering sewerage disposal plants might indicate the lack of any need for same. In my opinion, this is not the case. Sewer gas is flammable and when

it is likely to accumulate in hazardous concentrations we have a condition that requires the application of Article 500 of the N. E. Code. I would suggest that you also contact the National Fire Protection Association for information on this type of occupancy.—B.A.McD.

## Exit Signs

**Q.** Do directional electrical lighting fixtures (exit signs) of the recess type carry any special markings to indicate that the fixtures will attain temperatures in excess of 90° C?—E.C.

**A.** The following is an excerpt from the Underwriters' Laboratories Inc. Standard for Electrical Lighting Fixtures and Portable Lamps.

"9. A directional unit (such as an exit light) and a bathroom cabinet, either surface or recessed mounted, are judged under both the general requirements and all applicable specialized requirements *except those for recessed fixtures*. (Italics by the writer.)

Sections 4176 to 4180, inclusive, of the code set forth the requirements for all flush and recessed fixtures. All fixtures recessed in fire-resistant materials in building of fire-resistant construction attaining temperatures above 90° C but not higher than 150° C must be plainly marked as approved for such service, viz., U.L. requires marking to read "This fixture is suitable for installation only in buildings of fire-resistant construction, where the fixture is not mounted on or adjacent to combustible material".

If the fixture is not so marked, the code does not specifically offer any installation method for these units. However, Underwriters' Laboratories in their "Electrical Equipment List" for "Fixtures—Recessed Type" offers the following for the installation of

**THREE MASTER SELECTOR SWITCHES** (at control operator's right hand) help to speed firefighters on their way—in fifteen seconds after alarm. These G-E remote-control multicircuit switches give instant control of every inside and outside light.



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**100% LIGHTING CONTROL** with G-E remote-control wiring makes this building a standout for up-to-date electrical control. Architects—La Faye, Fair, Lafaye & Associates. Gen. Contr.—General Construction Co. Elec. Contr.—Dunn Electric Company.



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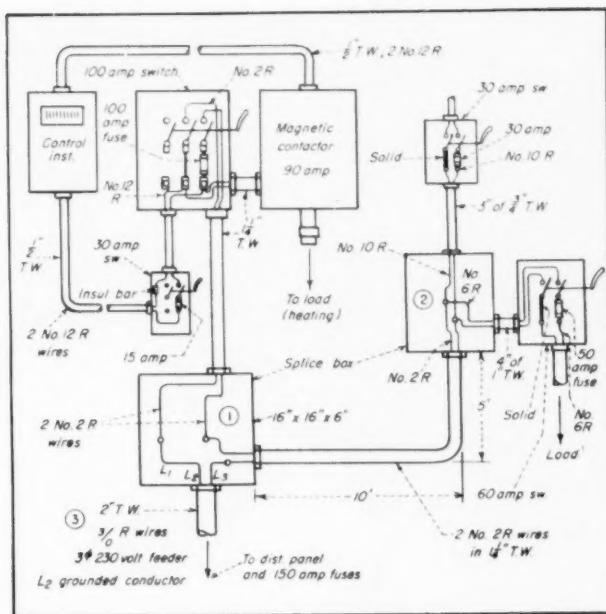
these unmarked high temperature recessed fixtures. "Recessed fixtures are intended to be installed with the recessed portion of the enclosure, other than points of support, spaced at least  $\frac{1}{2}$  inch from combustible material except that combustible materials in ceiling constructions within 1 inch of the ceiling line may also be in contact with the recessed portions of the enclosures".

The absence of this special marking on these exit fixtures creates a real problem for the field inspector. Actual experience has shown that these recessed units have been installed in direct contact with combustible materials. Test shows that the temperatures far exceed the 90° C limitation even with the smaller wattage lamps, i.e., 15 and 25 watt sizes. The condition is further aggravated in many localities where inexperienced help continually replaces the burned out lamps in these units with much larger lamps than are intended to be installed in the fixtures. Inspectors report finding 75 watt lamps in many directional signs. It is only due to the continual vigilance and insistence for proper corrective installation of these units, that keeps down the fire casualties from these defective installations.—B.Z.S.

## Feeder Taps

**Q.** I've never been able to obtain any specific answers on the length and sizes of taps. I'm familiar with Section 2434 paragraphs b, c and d. Is the enclosed illustration in practical accordance with the N.E.C.?—P.P.G.

**A.** A review of your wiring diagram shows a three phase, three naught 230 volt feeder with one phase grounded entering splice box No. 1. At this point a connection is made to L 2 and L 3 with two No. 2 Type R conductors. This tap runs to splice box No. 2 where two taps, one a No. 10 and the other a No. 6 are made to this first tap. In my opinion this procedure is in violation of Section 2434d of the Code. You start out to apply the 25-foot tap rule and then you make two more taps on the original tap which is not recognized by the Code. The 25-foot tap rule requires the tap to terminate in a single circuit breaker or set of fuses. Even though you had continued the No. 2 tap direct to the 60 amp. and 30 amp. switches there still remains a Code violation since the tap does not terminate in a single set of fuses.—B.A.McD.



The second tap made in splice box No. 1 consists of two No. 2 Type R conductors which run direct to the 100 ampere switch and fuse box. A No. 2 Type R conductor has a carrying capacity of 95 amperes. Assuming that the 25-foot tap rule applies there would be a Code violation, Section 2434d, since the tap must be protected by a fuse not larger than 95 amperes. Assuming that it comes within the 5-foot tap rule, Section 2434c requires the tap to be not smaller than the sum of the allowable current-carrying capacities for the conductors of the one or more circuits or loads supplied. Since the loads shown on your diagram are supplied by a No. 12 circuit and a No. 2 circuit, the sum of the carrying capacities for these circuit conductors totals 115 amperes. In order to satisfy this Code requirement the tap must have a current carrying capacity of at least 115 amperes which according to Table No. 1, for a Type R conductor, requires a one naught conductor.

The tap shown at the 100 ampere switch, consisting of No. 12 Type R conductors running to a 30 ampere switch and 15 ampere fuse appears to be in order provided the tap is not more than 5 feet long. The method of feeding the heating load and the control circuit through the 100 ampere switch enclosure might be criticized as a violation of Section 3737b which does not permit switch enclosures to be used for tapping off to other switches.—B.A.McD.

## Conductors

**Q.** Enclosed you will find two short sections of wire which were taken from an Underwriters' approved oil burning furnace and you will note that these wires are apparently insulated with an asbestos type of insulation, one being a No. 18 and the other being a No. 16. Can you explain this apparent Code violation?—T.D.

**A.** Any appliance or device which is approved by the Underwriters' Laboratories, Incorporated, as a completed appliance or device may have incorporated within it conductors which are of sufficient capacity to supply the electrical energy needed at proper voltage regardless of their size. Therefore, if a No. 16 or 18 conductor has ample capacity and amperage without an excessive voltage drop and is provided with proper insulation capable of withstanding the temperatures involved, it may be used on a device or appliance submitted to the Laboratories for their listing. The National Electrical Code makes mandatory the use of No. 14 wire for field work regardless of load with a few exceptions due entirely to the lack of adequate supervision and the inability to establish the total expected load following installation. However, on an appliance or device manufactured within a factory where construction specifications and prac-

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ices may be under constant supervision, it is possible to accept conductors which are capable of carrying sufficient current regardless of their wire size.—G.R.

### Grounding

**Q.** A local plant has installed for its water piping system, copper pipes with sweat joints. May grounding connections be made to this water piping system?—H.S.

**A.** Section 2613 prohibits the use of solder connections where the grounding conductor is attached to circuit wires or equipment. Section 2614 further prohibits soldered connections for the attachment of the grounding conductor to the grounding electrode.

By inference, inspectors have ruled that this prohibition of soldered connections would apply equally as well to any part of the grounding system. The use of the sweat (Soldered) joints in the copper water piping system as a grounding electrode is, therefore, not acceptable to some inspectors. The grounding connection to the water piping system should be made at some point beyond the sweat joint portion, provided this other portion is suitable for a grounding electrode. If such a water pipe grounding electrode is not available or is not acceptable, then some other grounding electrode must be provided, i.e., "Other Available Electrodes" as per Section 2582, or "Made Electrodes" as outlined in Section 2583.

Bonding around the sweat joints with approved clamps, pressure lugs, straps and conductors would be an acceptable means of assuring the continuity of the grounding system. This, however, may prove to be very uneconomical and thus not a practical solution for overcoming the solder connections in the electrode system. Brazed joints, if they can be made, would be acceptable.—B.Z.S.

### Sealing Fittings

**Q.** We are installing the wiring for a new suite of operating rooms in our hospital, and the question has arisen concerning the use of sealing fittings in the conduit runs serving the convenience outlets which will be within 18 inches of the floor and the junction boxes located in the attic space above the hospital operating rooms. Are sealing fittings necessary in these runs when the runs serve no other outlet between the junction box

and the convenience outlet? It is, of course, understood that the convenience outlets will be of the Class I, Group C, explosion-proof type.—P.R.

**A.** In the hospital operating room, the hazardous area is considered to extend from the floor to a point five feet above the floor level. Therefore, if the conduit run extending from the junction box in the ceiling to a convenience outlet in the wall is without couplings or other fittings where it enters this explosive area within five feet of the floor level, there need be no sealing fitting employed provided the convenience outlet is of the type which in itself employs a sealing fitting. Otherwise, if the conduit run has couplings or other fittings in the area which is considered hazardous, it must employ a sealing fitting where it leaves this hazardous area.—G.R.

## Interior and Outside Wiring

**Q.** Section 3382 of the Code covers the use of service cable for interior wiring. What does interior wiring cover?—O.P.G.

**A.** While the Code does not define interior wiring, Section 7301 tells us what is considered outside wiring. Reference to this rule shows that outside wiring intends to apply to wiring located on private or public premises, attached to the outside of or run between buildings and structures, but shall not apply to wiring for signs or other extensions of interior wiring. In line with the foregoing, I believe we are correct in saying that interior wiring includes any wiring within the walls or foundations of a building or structure and all the areas between walls that comprise a building, plus sign wiring or other extensions of interior wiring.—B.A.McD.

## Lightning Protection

**Q.** We are planning to rewire a grain elevator and the owner has shown us a letter from his insurance company which states that in this rewiring program lightning protection must be provided for the service equipment to this building. Is that a Code requirement, or is it just a requirement of the insurance company?—O.M.A.

**A.** In your area, this would definitely be a Code requirement



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inasmuch as Section 5053 of the National Electrical Code reads as follows:

"Surge Protection, Class II, Divisions 1 and 2. In geographical locations where lightning disturbances are prevalent, wiring systems in Class II locations shall, if supplied from overhead supply systems, be suitably protected against high-voltage surges. This protection shall include suitable lightning protective devices, interconnection of all grounds, and surge-protective capacitors."

If the secondary service lines between the elevator and the transformer bank supplying energy are in excess of 300 feet in length, it would be advisable to utilize lightning arresters on the secondaries outside the elevator, in addition to the surge-protective capacitors which must be attached to each underground service conductor. These capacitors must be attached to the supply conductors on the supply side of the service disconnecting means and should be protected with 30 ampere fuses or breakers of suitable type and voltage rating. It is also advisable in grain elevators to interconnect all conductive mediums such as metallic elevating legs, spouting, etc., with the conduit system so there cannot be a voltage potential difference.—G.R.

which might occur between the ungrounded piping system and the grounded system. Such a condition promoted arcing and often resulted in damage to motors or the elements of heating devices. Section 2581 of the Code covers the question and the Inspector is correct.—B.A.McD.

## Official NEC Interpretations

### INTERIM AMENDMENT NO. 94, NEC

Subsequent to action by the Correlating Committee of the National Electrical Code Committee, National Fire Protection Association, in accordance with the Procedure for Interim Amendments to the National Electrical Code, the following approval of Interim Amendment No. 94 has been announced in Bulletin No. 51-26:

Revise the text of the 1951 edition, NEC as follows:

1. SECTION 5241. "Circuit Loads"—in the 4th line, change 15 to 20 amperes.

2. SECTION 5256. "Conductors for Portables"—in the last sentence change 15 to 20 amperes.

3. SECTION 5292. "Overcurrent protection"—in the 5th line, first sentence, change 15 to 20 amperes.

4. SECTION 5293-f. "Interior Conductors"—in the 6th line of the second sentence, change 15 to 20 amperes.

### INTERPRETATION NO. 375

Issued Dec. 19, 1951

#### Section 2351-e

#### Transfer switch for Emergency Supply

QUESTION: Do two pull-out switch bases, one in the service from the power company and the other in the supply from an emergency lighting generator, meet the intent of paragraph "e" of section 2351 of the 1951 National Electrical Code, when a single interchangeable pull-out unit is provided, so that in the event of power failure it may be removed from the main service equipment and inserted in the supply line from the emergency lighting generator?

Answer: Yes.

### INTERPRETATION NO. 378

Sections 3622 and 3624

#### Wireways, Use and Allowable Fill of Conductors

QUESTION NO. 1: Is it the intent of Section 3622 to prohibit the use of wireways in office occupancies?

Answer: No.

QUESTION NO. 2: Are the normally non-current carrying neutrals of 3-phase, 4-wire or single-phase, 3-wire circuits to be counted when the 30 conductor limitation in Section 3624 is applied?

Answer: Yes.

*no description needed...*



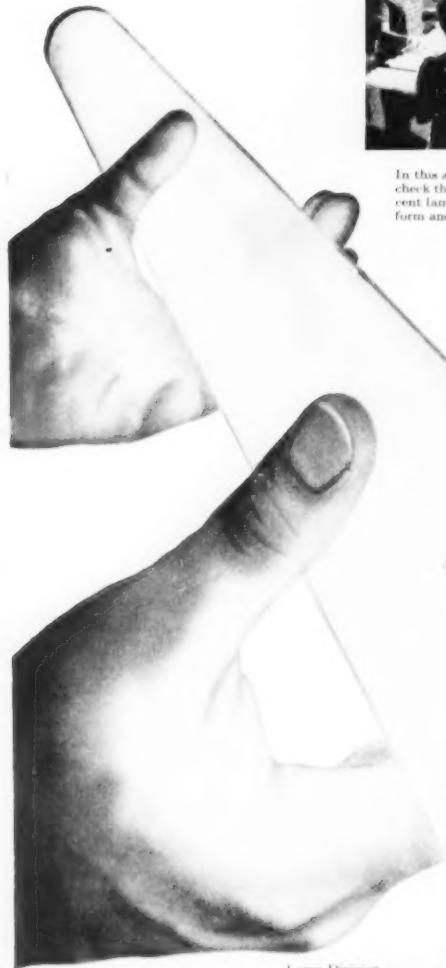
those who use **General** switches  
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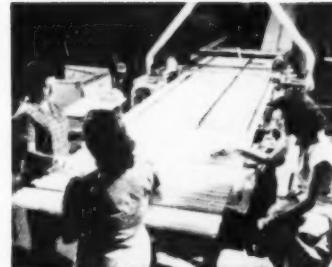
**ENCLOSED SAFETY SWITCHES - BRANCH CIRCUIT PANELS - SERVICE ENTRANCE EQUIPMENT**

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . FEBRUARY, 1952





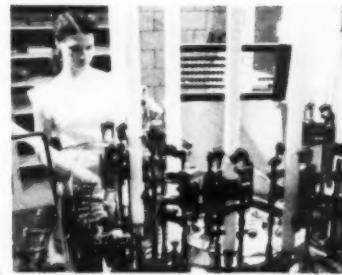
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## NEWS FROM WESTINGHOUSE, THE FASTEAST-GROWING LAMP MANUFACTURER

by Sam Hibben



### DID YOU KNOW?

Many deep sea fish have built-in fluorescent lights, but one of them has a twist: The sub-order Ceratioidae has its fluorescent lamp on the end of a pole! Smaller fish go after this luminous bait, and wham—they get eaten. The trick, I suppose, is how to keep big fish from going after the bait—but big ones seldom go that deep, and many lighted-up fish can dim out at will.



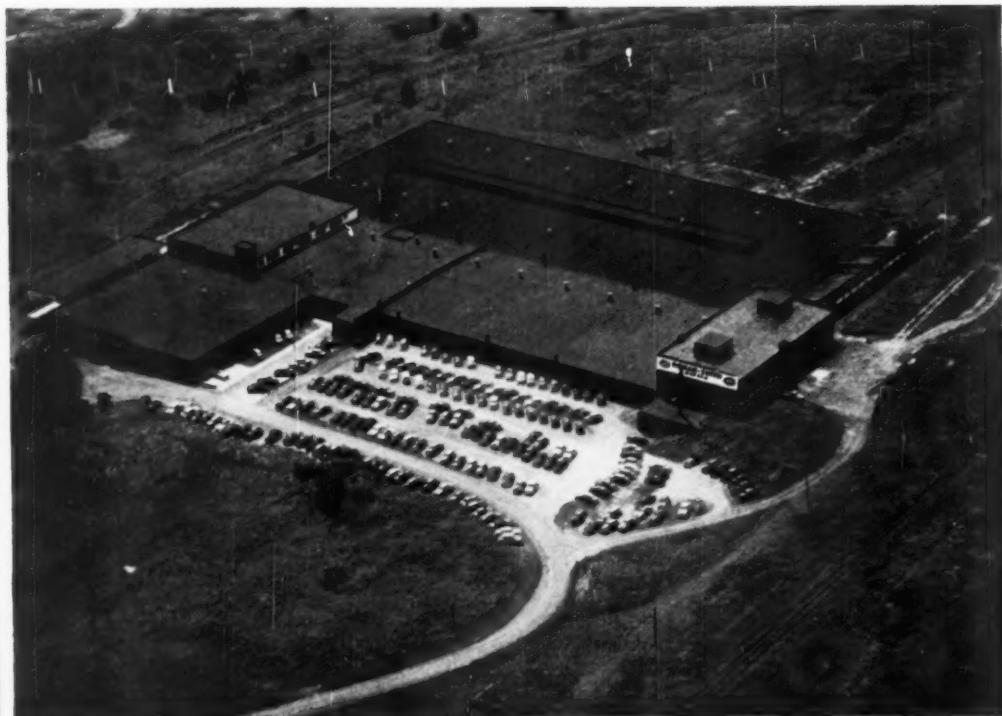
Fish, incidentally, have—like onions, cabbage or dozens of other foods—wholesome but penetrating odors when cooked. Westinghouse has just introduced a tiny lamp that destroys odors—it really does. The lamp puts out rays that create ozone, and the ozone oxidizes the floating molecules of most common odors. It's easier to operate than explain, but it costs only about 5¢ a week to burn and it keeps air fresh and sweet.

### A THOUGHT FOR THE DAY:

Your eye lenses act much like a camera's. This means that the image on your retina is upside down. That is, the top of the tree registers on the bottom of the eyeball. You've simply learned to interpret it around again after the electric impulses have carried the "television" picture to the brain. Had you known you were that smart, or does the world still look upside down?

*More next month.*

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# Practical Methods



**HEATING CABLE** was laid on wire mats about 2½ to 3 inches below the concrete runway surface; flat-car mounted cable reels facilitated laying of cable runs.

## Heating Cable Melts Runway Snow

### CONSTRUCTION

Ice and snow no longer interfere with the vital use of outdoor crane and transport runways at the South Milwaukee, Wisconsin, plant of the Bucyrus-Erie Company. Elimination of any ice or snow which might obstruct crane or transport operations is now effected in a few hours by General Electric's flexible, lead covered heating cable. In this novel application, a tailored-layout of the heating cable provides sufficient heat to the concrete runways to clear snow and ice quickly, even at temperatures as low as eleven degrees below zero.

Installed under four runways ranging from 100 to 275 feet in length and about 10 feet wide, the heating cable was laid on wire mats about 2½ to 3 inches below the surface. Cable runs were made on approximately 3 inch centers and were secured to the wire mat. To facilitate installation of the 40,000 feet of cable used, cable reels were mounted on a flat-car which could be moved along the runways.

Special transformers were required to supply the correct voltage for the non-standard lengths of heating cables. These transformers, built for this particular installation by the General Electric Company's Milwaukee service shop, deliver about 180 volts for the shortest runway and about 500 volts for the longest.

Along the edges of the runways, tile drains provide adequate drainage for the melted snow. The heating cable keeps the drains free of slush.

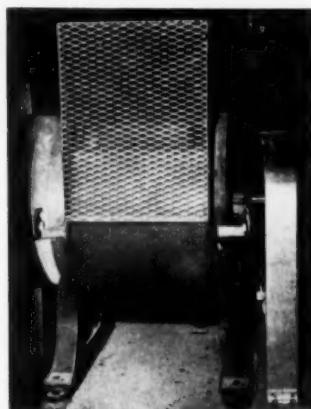
## Air Cooled Transformer Room

### CONSTRUCTION

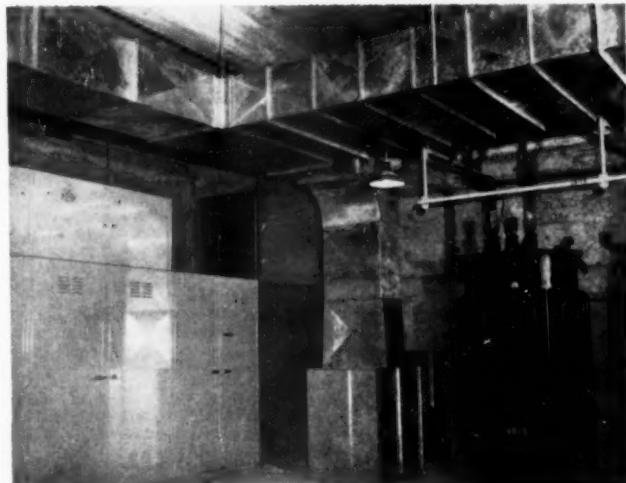
Adequate ventilation is an important factor in the design of any transformer room whether it be large or small. Unless there is a free circulation of air within the room, there is danger of the units overheating even under normal operating conditions. This is particularly true of installations where ambient temperatures are high due to climatic conditions.

There is no concern about this condition in the General Petroleum Corporation's new office building at Los Angeles, California. Forced air ventilation solved the problem in the main "service" transformer vault of the building.

The vault contains two banks of three (each) 500-kva, single-phase, 5,000/480v oil cooled transformers with associated primary switchgear.



**CLOSEUP OF BLOWER** behind a transformer bank. Unit is attached to air duct terminal at left.



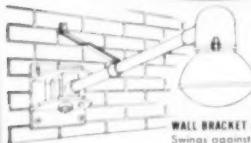
**COLD AIR DUCTS** in "service" vault feed blower behind a bank of three transformers. Similar unit forces cold air over second transformer bank on opposite side of room. Exhaust grilles in wall at ceiling line carry out heated air and provide free air circulation.

**NEW**

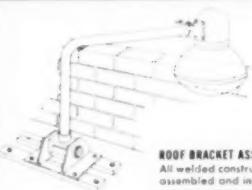
# NEPO

Mercury  
Vapor  
Floodlight

## offers more!



WALL BRACKET ASSEMBLY  
Swings against wall for  
servicing. Easily installed—  
all components supplied.



ROOF BRACKET ASSEMBLY  
All welded construction. Easily  
assembled and installed—  
every component supplied.



Display lighting of a fashionable suburban shopping center with NEPO luminaires. The light is concentrated—where it's needed!



This brilliant, NEPO-illuminated gas station is plainly visible for a great distance up and down the highway!



Industrial plant is well protected by NEPO illumination. Many installations such as above in Chicago industrial districts.

**More Light** — up to 300% more than incandescent!

**And Pleasing Light** — with either the E. H.-1 or the new J. H.-1 color-corrected lamp. For display purposes you get an amazingly white, *daylight-like* light!

**More Economy** — uses much less electricity than comparable incandescent... and the rustproof, weatherproof NEPO Luminaire rarely needs cleaning or maintenance. Usually pays for itself through savings within one year.



**LIGHTING TRANSFORMER** vaults like this are located on every third floor throughout building; have floor and ceiling grilles for cool air circulation. Secondary bus duct feeds breaker cubicle. Metal troughs enclose transformer connections and secondary feeders to distribution points.

Overhead sheet metal ducts feed cold air to blowers located on the floor at one end of each transformer bank. Each blower forces a blast of cool air over the units. As the heated air rises, it is exhausted through a vent located at the juncture of ceiling and wall to assure complete air circulation.

Secondary distribution at 480-volts, three-phase, begins at a switchboard adjacent to the transformer room and is carried throughout the building by bus duct risers. On every third floor is a narrow vault containing a bank of single-phase, air cooled, 480/120/208-volt transformers to serve distribution centers for air conditioning, lighting and other branch circuit equipment. Ventilation grilles at the floor and ceiling line of one wall in each of these vaults assure a continuous circulation of cool air to help dissipate the heat generated by the units.

## Newest and Best—

### FOR DISPLAY there's nothing better!

The new NEPO Luminaire directs plenty of natural, daylight-like light where you want it...can be hung at any elevation. Here's the ideal illumination for store fronts, billboards, filling stations, drive-in theatres and outdoor displays of all types. It's high intensity, *concentrated* lighting at amazingly low cost!

### FOR PROTECTION it's best!

The answer to the protective lighting problems of restricted areas, industrial plants, warehouses, freight terminals, docks, parking lots, and all other outdoor areas that must be protected during night hours. Excellent inside the plant, too — wonderful, dustproof, highway illumination.

**BRACKETS AND POLES** for any type of installation are available from the factory — write for specifications and prices. The entire unit and all accessories are of quality construction throughout. The entire unit is rustproof and weatherproof because the Alzak aluminum reflector is spun right over the glass bowl by a patented process — assures greater cleanliness and increased safety. Entire unit weighs only 10 lbs.

## Heavy-Duty Floor Flanges Anchor Conduits To Concrete

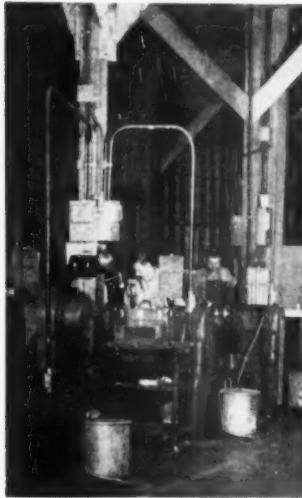
CONSTRUCTION

In many shops where branch circuits are dropped from an overhead distribution system to machines, provision is made through condulets, dummy sections of conduit, and floor flanges for securing the wireways to the floor. However, where industrial trucks are liable to bang into these anchors, or where vibration is severe, standard-weight fittings and insecure fixings soon result in damaged extensions.

A more rugged form of construction can be secured by using heavy flanges,

**NEPO MANUFACTURING CO.**

527 S. WELLS ST. • CHICAGO 7, ILL.



**FLANGES AND PIPE** are heavy duty, flame-welded to resist shock and vibration. Bolt holes are located by template and drilled into concrete to secure conduit anchor.

expansion shields, standard pipe and flame-welded connections between pipe and flange. Bolt holes should be carefully marked with an accurate template of the hole pattern, and this entire pattern should be shifted if the drill strikes a rock fragment in the concrete slab, thus preventing the hole to reach its full depth. If it is not feasible to move the pattern, one of the flange holes can be filed to permit a slight shifting of the obstacle-striking bolt.

With wiring conduit dropped to the tap-off level, heavy-duty anchors secured below this point, and flexible connections between conduit and machine control, long trouble-free service can be expected from the branch drops.

### Air Clamp Holds Bus In Drill Jig

#### CONSTRUCTION

On a recent substation project installed by Barnes & Brass Electric Co., Clarksburg, W. Va., the necessary bus bars were prefabricated in the contractor's shop. After each section of bus was cut to measurement, and before it was bent to specification, a hole had to be drilled in each end. The complete project involved drilling thousands of holes in copper bus ranging from  $1/4$  in. by  $6$  in. to  $1/4$  in. by  $8$  in. in size.

To speed this operation B & B mechanics mounted an air cylinder clamp on the drill press so positioned

**NOW!**  
**ONE SAW**  
**makes every cut**  
**In 2 in. dressed**  
**lumber**

**magic pivot**

**NEW**

*Fred Wappat*



MAXAW 70, heavy duty, all ball bearing industrial quality  
—Cuts 1-7/8 in. at 45° — 2-1/16 in. straight

Make all 45° Cuts



for all construction in 2 in.  
dressed lumber

**MAXAW 70**

**\$69.50**



GET THIS FREE PLYWOOD AND LUMBER FOOTAGE CALCULATOR  
Here is something every man who cuts lumber needs to help him do faster, more accurate work. Sent free on request.

OTHER magic pivot MAXAWS for Heavier Duty Work



MAXAW 80  
2-3 1/16 in. at 45°  
2-5/8 in. straight



MAXAW 90  
2-3 1/16 in. at 45°  
2-5/8 in. straight



MAXAW 110  
2-13/16 in. at 45°  
3-7/16 in. straight



Over 60 Years of  
Precision Manufacturing  
for Customers Who  
Must Be Satisfied

**Fred Wappat INDUSTRIALS**  
DIVISION OF  
**Cummins-Chicago Corp.**

4740 N. Ravenswood Ave. • Chicago 40, Ill.

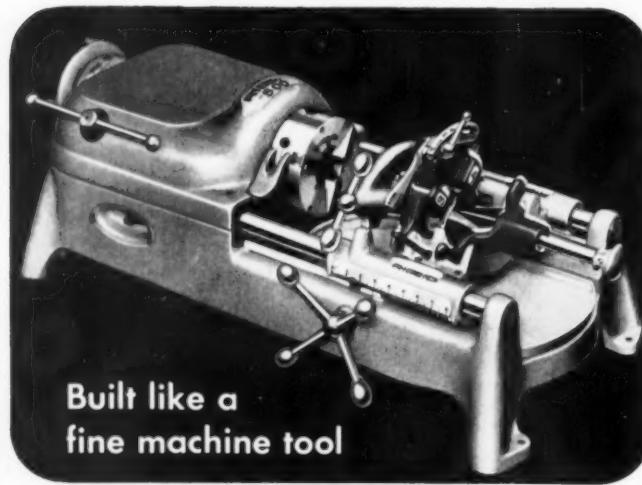
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# Announcing THE GREAT NEW

# "500"

## PIPE & BOLT THREADING MACHINE

Conduit Dies Available

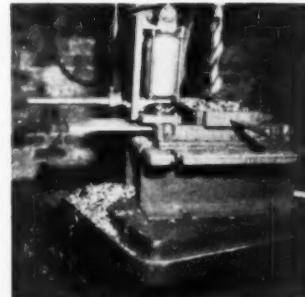


Built like a  
fine machine tool

## Full of typical Rigid Improvements

- Range  $\frac{1}{4}$ " to 2" conduit or pipe;  $\frac{1}{4}$ " to 2" bolts.
- Cutting, threading and reaming tools operate independently and right up to chuck, swing up out of way when not in use.
- New Rigid quick-opening quadritype, dualtype and monotype die heads save time and work.
- Concealed oil system, reversible pump, no priming.
- More than 20 other efficiency improvements—write for complete profit story on this new Rigid "500".

THE RIDGE TOOL CO. • ELYRIA, OHIO



AIR CLAMP holds bus bar securely while holes are drilled in end.

that it would be just to the left of the drill jig template. The drill press operator merely pushed the copper bus bar under the air clamp and drilling template until it hit a stop bar; pressed a foot switch which lowered the air cylinder plunger to clamp the bar securely; then drilled the hole. After releasing the clamp, he removed the bar and repeated the operation. Savings in time more than paid for the addition of the air clamp.

## Contractor Builds "A Future"

PROMOTION

Ten years from now, when the youngsters of Freeburg, Illinois, have grown up and are home-owners and business people, chances are that the Frank Kaiser Electric Company will be a prosperous electrical contracting organization. And it will be easy to trace a good measure of this firm's success back to the year 1951, when a clever promotion plan sowed the seeds of future sales.

This clever plan consisted of a "Mis-spelled Ad Contest" which encouraged the town's "younger set" to visit the store and get an idea of the electrical contracting organization with which they will be doing business in the future. Under the plan, handsome prizes were offered to youngsters who could identify 10 misspelled words in a full page Kaiser Electric advertisement in the local newspaper, and bring the ad in with the mistakes circled. Each of the misspelled words was part of the copy describing an item offered in the ad.

Youngsters were taken on a tour of the drafting rooms, show room, supply room and offices. Many of these youngsters got their first acquaintance with a modern electrical contracting organization. The advertising value and sales promotion of this plan were well recognized by Frank Kaiser, owner of the firm.

Your installations

need

# SEALTITE

wherever electrical

wiring needs the

best protection —

## American's flexible Liquid-Tight Conduit

ANACONDA American Sealite Electrical Conduit has a core of flexible galvanized steel tubing, covered with a liquid-tight synthetic jacket. It comes in long, random lengths—can be cut and assembled on the

spot without special tools. Sealite<sup>®</sup> uses the same type fittings as standard rigid electrical conduit. Your electrical supply house carries Sealite and all accessories including fittings, bushings and gaskets.



\*Trademark

for flexible, liquid-tight electrical conduit —

use

# SEALTITE

AN ANACONDA PRODUCT

THE AMERICAN BRASS COMPANY, AMERICAN METAL HOSE BRANCH, WATERBURY 20, CONNECTICUT. IN CANADA: FAIRBANKS-MORSE COMPANY, LTD.

# Sets Fastening

It's fast, easy and  
safe to operate  
The Remington  
Stud Driver.



Simply hand-assemble stud and power cartridge, load as a unit in easy-to-open Remington Stud Driver, and close.



Then press loaded Stud Driver firmly against surface, depress safety lever, and pull trigger.



Explosive charge imbeds stud solidly. Open Stud Driver with a twist of the wrist, eject empty shell, load next stud. Whole job takes seconds!

Speeds all these jobs—  
and many more!

1. Attaching conduit and panel boxes to steel, concrete or brick.
2. Anchoring fluorescent and other lighting fixtures in concrete.
3. Radio and television fastening.
4. Fastening conduit clips to concrete or steel.
5. Fastening eye bolt in concrete for stringing wires.

## THE RIGHT STUD FOR EVERY JOB

Studs are available in different types to meet the requirements of any specific fastening job. Made of a special, hardened steel alloy, these studs were developed by Remington after exhaustive testing for hardness, strength and profile. Pull-Out resistance is as high as two tons, depending on stud used.

Five different power loads are clearly indicated by colored plastic heel caps. These tough heel caps permit instant assembly of any cartridge with any Remington stud. Easily removed from the stud after driving, the heel cap also protects the thread of the driven stud.

### STANDARD HEAD



### BREAK-OFF HEAD



### INTERNAL THREAD



### EXTERNAL THREAD



Only Remington studs are identified by this target trademark on the head—it's your assurance of safe, dependable fastening.

**Studs up to 100 Times Faster  
than Conventional Methods  
...and Does it Safely!**

**NEW CARTRIDGE-POWERED  
MODEL 450**

# REMINGTON STUD DRIVER

## LOOK AT ALL THESE FEATURES

**COMPACT AND PORTABLE**—Weighs only 5½ pounds, ideal for scaffold, ladder, overhead work, inaccessible places. Comfortable to use in any position.

**SPEED**—One man can set up to 5 studs per minute, as much as 100 times faster than other methods. Sets studs at whatever depth is required up to 2½ inches, depending on material.

**ELIMINATES INVESTMENT** in outside power—Self-powered. Especially useful in isolated places.

**FOUR WAYS SAFE**—Plainly visible red dot indicator shows when it's cocked; safety lever must be depressed before and during squeezing of main trigger; permanently attached safety shield must be compressed against work before Stud Driver will operate. Stud Driver will not operate if tilted at more than a slight angle. Slight recoil. Low noise level.

**RUGGED**—All working parts of the Stud Driver are made of heat-treated alloy steels, housing of strong, lightweight aluminum that carries no operating stress. Lining of safety shield is a solid block of tough, resilient Du Pont neoprene.

**PRICE** for Model 450 Remington Stud Driver complete in rugged steel carrying case—only \$119.50.

**Revolutionary tool fastens  
steel or wood to concrete  
or steel in seconds!**

Speed construction fastening jobs and cut costs with the amazing new Remington Stud Driver. This lightweight fastening tool easily sets as high as 5 studs per minute. Easy to operate, it needs no outside power source . . . needs no other equipment!

The Remington Stud Driver is compact, rugged and safe. With one lightning-fast operation, it firmly fastens steel or wood structural pieces and fittings to concrete or steel surfaces.

Test-proved to be the world's finest and speediest fastening system, the Model 450 Remington Stud Driver is made by Remington Arms Company, Inc., *America's oldest and foremost sporting arms manufacturer*. To obtain detailed information on this time- and money-saving tool, and for the name of your nearest distributor, fill out and mail the coupon below.

**"If It's Remington—It's Right!"**

# Remington



Remington Arms Company, Inc.  
Industrial Sales Division  
938 Barnum Ave., Bridgeport 2, Connecticut

I am interested in obtaining descriptive literature on the Model 450 Remington Stud Driver.

Name

Firm

Position

Address

City  State

# Cut your safety switch inventories with new, simplified BullDog Vacu-Break line

Only 37 Type A switches now replace hundreds . . . fill every A, C and D requirement at Type C prices

**Here's great** news for contractors: a practical, profitable way for you to slash your safety switch inventories to the bone, yet maintain a better balanced stock.

*Stock and install the new, simplified line of BullDog Vacu-Break Master Safety Switches.*

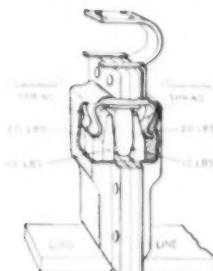
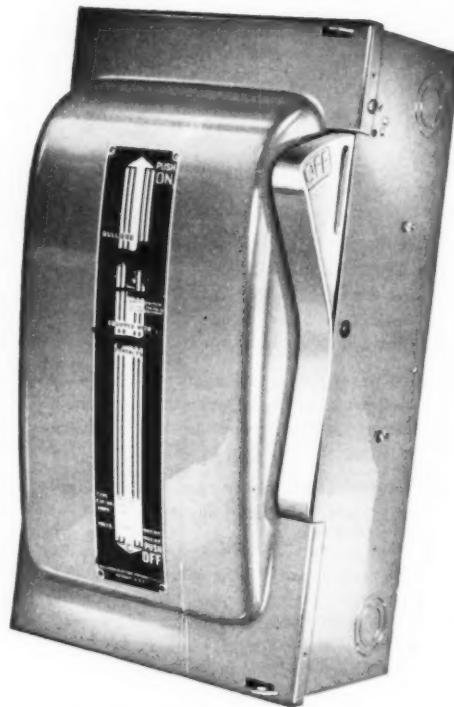
Here's a complete line of highest-quality, Type A switches. It's streamlined. Only 37 catalog numbers in all now replace hundreds; fill any A, C, D requirement at C prices . . . meet all Type A safety switch specifications.

In short, it's a *Master Line* that will save you time, effort and money wherever you order, stock and install safety switches.

There's no duplication of items. No endless list of complex catalog numbers to bother with. No slow-moving switches that will fit only occasional installations, tie up your space and operating capital.

You'll find that you can stock far fewer BullDog switches and still be well prepared for those rush jobs. You'll profit from easier handling and speedy installations. And your customers will go for the idea of Type A switches at Type C prices — improved quality at less cost to them.

Why not find out all about the BullDog Master Line? See why contractors all across the country call it the greatest step ever taken to straighten out safety switch problems. Write BullDog, Dept. 453-B, for descriptive bulletin and other details. Or see your BullDog Distributor.



**EXCLUSIVE CLAMPMATIC CONTACTS!** Clampmatic is a method for obtaining extra and enduring contact between switch jaws and blades. In ordinary switches, jaws exert about 10 lbs. pressure on blade. In Vacu-Break Switches, the Clampmatic spring augments this with 20 lbs. on both line and load sides of jaws. Thus Clampmatic provides a total of 30 lbs. pressure between both sides of blade and jaw for bolt-tight contact.

## Other features include

- Exclusive Vacu-Break principle of circuit rupturing
- Cover Interlock for extra safety. Use optional.
- Quick-make and quick-break
- Anti-creepage corrugations on switch bases and arc chambers
- Horsepower-rated
- Solderless cable terminals (wire grips)
- Silver-surfaced current-carrying parts
- Spring-reinforced fuse grips
- Ample supply of concentric K.O.'s
- Generous wiring space in all switches



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IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO

PIONEERS IN FLEXIBLE ELECTRICAL DISTRIBUTION SYSTEMS

# In The News

## Maintenance Achieves Professional Status

**Third annual Plant Maintenance Show and Conference is attended by 14,500 engineering, executive, educational, governmental and manufacturing representatives.**

**G**ROWING appreciation that maintenance is vital to today's industrial economy was forcibly emphasized last month when over 14,500 electrical and mechanical bosses, plant engineers and service department heads converged on Philadelphia to attend the 3rd annual Plant Maintenance Show staged in Convention Hall January 14th-17th. This show—largest and most comprehensive to date—was supported by 274 exhibitors who displayed and demonstrated over 6,000 machines and products useful in various aspects of maintenance. Concurrently, the Plant Maintenance Conference attracted the enthusiastic interest of 2100 registrants who attended 29 informative general sessions, roundtable discussions and sectional forums in which maintenance problems, procedure and methods were analyzed by 57 leaders representing the viewpoints of industry, government and manufacturing. The conference, chairmaimed by L. C. Morrow, consulting editor of *Factory Management and Maintenance*, was concluded the evening of the 16th when Manly Fleischmann, Defense Production Administrator, discussed "Plant Maintenance in National Defense" at the annual banquet.

Of particular interest to electrical men was a forum on the "Maintenance of Electrical Equipment" led by Joseph Petruska, superintendent of maintenance at Wright Aeronautical Co., Wood Ridge, N. J. Mr. Petruska discussed the requisites of an effective maintenance organization, the values of a fundamental training program, an adequate supply of spare parts, safety equipment and properly maintained machine tools. He also analyzed the wisdom of in-plant motor repairing, keeping a variety of metering equipment on hand, adopting modern lighting and installing a flexible power distribution system. The interest of his remarks was reflected by the forum that followed; questions on

group replacement of lamps, the handling of trouble calls, electronic control, the care of battery trucks, cleaning of motors and prescribed checklists for various types of equipment keeping the group in session for an additional two hours.

At various general sessions, panel discussions were presented on Maintenance Costs, Inspection Methods and Records, Planning and Scheduling Maintenance Work, Training Maintenance Workers and Supervisors, and Lubrication. These sessions, each attended by from 1100 to 1600 delegates, were followed by intensive question and answer periods. Problems on electrical welding, materials handling and power plant maintenance were among the various forum subjects.

The gigantic scope of maintenance was emphasized by General Chairman Morrow who opened the conference with the statement that "a minimum of \$5-billion will be spent in 1952 for maintenance of the nation's manufacturing plants. This year's show and conference," he continued, "confirms what the first and second established, namely, that maintenance has reached professional status, with those responsible for maintenance functions having outgrown their former 'fix it' attitude and now thinking in terms of *preventing* breakdowns by *planned upkeep*."

At the first general session, Oliver R. Etheridge, methods superintendent of A. E. Staley Mfg. Co., Decatur, Ill., explained that maintenance costs depend upon varying accounting procedures, wage and labor policies and local thinking concerning high replacement vs high maintenance, trade skills vs general maintenance crews, plant appearance vs functional effectiveness, safety provisions and production policies. "Maintenance is definitely a part of business," he stated, "and until the combination of production, maintenance and capital structure costs is considered together, the *apparent* cost

of maintenance is misleading."

Mr. Etheridge was followed by L. S. Houk, a former electrical contractor and now director of headquarters works engineering for Westinghouse at Pittsburgh, who asked and answered the question, "What constitutes the cost of maintenance and how is it determined?" In discussing the requisites of effective cost comparison, he emphasized that only simple, easily understood and fast systems will survive the pressure of continuous in-use testing.

"Maintenance must be intelligently applied" claimed M. H. Howarth, superintendent of Western Electric's manual apparatus shops in Kearny,



**PLANT ENGINEER H. M. (Mike) Eversz, McCulloch Motors Corp., Los Angeles, discusses electrical wiring problems involved in their plant expansion program with Ray C. Gunning, Supt., Larsen-Hogue Electric Co., Los Angeles electrical contractors who have been kept busy in the McCulloch plant for the past six years during its phenomenal growth. During this period Mike and Ray have also organized and promoted the Electrical Maintenance Engineers group in Los Angeles, and served in various capacities including chairman and secretary of the EME group.**

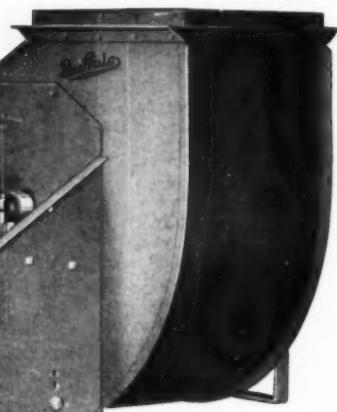
# Practical Answer to many VENTILATING PROBLEMS

Many thousands of these "Buffalo" Fans now operating are doing a good job on ventilating service. Their quiet, low-maintenance performance and long life are continually adding to the "Buffalo" reputation for value. Shown here are three of our most-called-for fans. You'll want to get the facts on these profitable lines which meet many requirements.



## BUFFALO "E" BLOWERS-EXHAUSTERS

Husky, one-piece units for forge and furnace blowing, cleaning operations, cupola work. A number of these units often effect installation and power savings over one large fan, and permit flexibility of operation. **WRITE FOR BULLETIN 3014-C.**



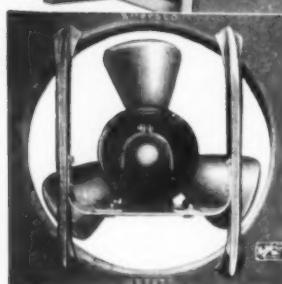
## BUFFALO BELTED VENT FANS

Here are light, compact, easily installed ventilation fans. They are non-overloading, and can be installed indoors or outdoors. Capacities are from 500 to 20,000 cfm at 4" s.p. **WRITE FOR BULLETIN 3720.**

## BUFFALO BREEZO FANS

So simple to install and service, these fans appeal to economy-minded firms! Of heavy-duty construction throughout, they have rigid die-stamped panel, arms and blades.

Available in 6 sizes,  
8" to 24". **WRITE  
FOR BULLETIN  
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First For  
Fans

## BUFFALO FORGE COMPANY

520 BROADWAY

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Sales Representatives in All Principal Cities

PANEL BREEZO FANS . BELTED VENT SETS . BELT-AIR FANS  
BREEZ-AIR ATTIC FANS . "L" BREEZO FANS . "NV" BREEZO FANS



**W. D. SHALER**, Electric League of Western Pennsylvania and **Carl J. Long**, consulting engineer, both of Pittsburgh, Pa., seem highly pleased as they tabulate registration results at end of the Industrial Electric Exposition held in Pittsburgh last fall.

N. J. and, to illustrate his point, he cited cases where some specially-wound motors costing \$50 were being wastefully repaired for \$80, and where costly, highly refined hydraulic oils were being wastefully used for ordinary lubrication purposes when cheaper grades would be adequate. Other cases illustrated that money was not the sole criterion of maintenance costs, for more expensive jobs resulting in greatly reduced shutdown periods were definitely justified.

On the same subject of Maintenance Costs, C. E. Knight, plant engineer for the plastics division of Monsanto Chemical, Springfield, Mass., added that "basic detailed information on repairs and maintenance is a 'must', but it should be assembled and presented in specific ways if it is to meet specific needs. To illustrate, if the information is summarized for a single piece of equipment it may highlight the need for replacing one unit; if summarized by production departments it may indicate the need for special educational or corrective programs. The ratio of material to labor costs," he concluded, "might also be used as a rough index of labor efficiency."

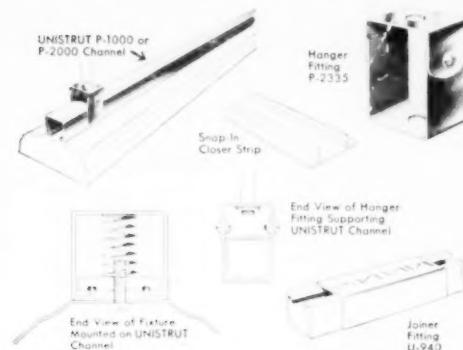
At the second general session, John A. Willard, president of maintenance consultants Bigelow, Kent, Willard and Co., Boston and New York, stated that "Preventive maintenance properly organized and operated is insurance against uninterrupted production and is therefore referred to more and more, as *productive* maintenance." He went on to say that "an effective program should consider (1) *what* to inspect, (2) *for* what to inspect, (3) *how* to inspect, (4) records and (5) *use* of inspection data." Each of these components was graphically illustrated.

**ADJUSTABLE UNISTRUT CHANNEL, HANGERS and FITTINGS INSTALLED  
by METALS & CONTROLS CORPORATION to SUSPEND FLUORESCENT FIXTURES**



\*Planned and executed by G. E. Pieper, Materials Engineer, Spencer Thermostat Division, Metals & Controls Corporation, Attleboro, Mass.

**UNIQUE METAL FRAMING SYSTEM PROVIDES  
PERFECT FIXTURE ALIGNMENT, ADDED SAFETY AND  
COMPLETE FLEXIBILITY FOR LATER CHANGES OR  
ADDITIONS IN BIG PLANT RELIGHTING JOB.\***



U.S. Patent Numbers  
2,757,471 2,798,615  
2,746,460 2,798,612  
2,860,378 2,805,631  
2,841,908  
Other Patents Pending

**FOR DEFENSE PRODUCTION**  
Every day the value of UNISTRUT products is being proved by their use in Defense Industries and Armed Services installations where flexibility, and assembly and erection speed count most. The UNISTRUT method conserves steel, reduces manpower hours, cuts overall costs!

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**UNISTRUT Products Are Bonderized**

**The World's Most Flexible  
All-Purpose Metal Framing**

Photo shows rows of 2-lamp 40-watt luminaires supported from overhead "I" beams by UNISTRUT channel, hangers, stems and beam clamps. The versatile UNISTRUT system permitted attachment of supporting stems at any point along the channel length so that luminaires could be spaced at regular intervals without interference from overhead piping or duct, and in spite of varying distances between beams. (Photograph by Metals & Controls Corporation.)

The functional UNISTRUT method of hanging fluorescent fixtures provides advantages obtainable by no other means. Permits faster, easier, more accurate installation. Requires fewer hanger stems and canopies. Cleaning and servicing cannot disturb fixture alignment. Lowers wiring and rewiring costs. UNISTRUT channel is approved as wireway in Chicago and 20 other major cities—additional proof of its versatility and usefulness. Try it on your next lighting job!

**Write today for your FREE Copy of New 78-page Catalog No. 700!**  
Includes above drawings and countless other examples of how to mount, rack, frame, suspend and support all kinds of electrical and mechanical equipment.

**UNISTRUT PRODUCTS COMPANY**  
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IT CAN BE TOLD  
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6 LINES  
of Electrical  
products from  
1 dependable  
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FLUORESCENT  
REFLECTORS  
RECESSED  
INCANDESCENT  
BOXES  
VAPOR PROOF  
UNITS  
FLOODLIGHTS  
MATERIALS FOR  
ELECTRICAL  
CONSTRUCTION

Insulators      Switch Plates  
Weather Proof Sockets  
Conduit Fittings

YES, we've recovered from our  
fire and are in normal produc-  
tion again

**THE SPERO ELECTRIC  
Corporation**

18222 LANKEN AVENUE  
CLEVELAND 19, OHIO

P.S. We have territories  
open for manufacturers'  
representatives.



**CONSULTING ENGINEER** Beverly A. Travis of Seattle believes in quality lighting and improved electrical systems, as evidenced by his work in both fields. He has pioneered 480/277 volt distribution Boeing Aircraft, Seattle, and 208/120-volt distribution for apartment buildings in the Northwest, and has served as chairman of the IES Empire Chapter in Seattle. His own office, indirectly lighted to a 50 footcandle level by custom-built fluorescent luminaires, bears silent testimony to his sponsorship of better lighting for improved seeing.

Gilbert L. Ross, president of Ross & Co., N. Y. City, analyzed Planning and Scheduling Maintenance Work, defining planning as "the determination of (a) what is to be done, (b) what materials and parts are needed, (c) how it is to be done, (d) what special tools, if any, will be needed and (e) what and how many craft-hours will be required."

At the third and final general session, Chase O. Oren, superintendent of shops and maintenance for Dow Chemical at Midland, Mich., discussed Training Workers and Supervisors. He first listed the qualifications of a plant electrician, then outlined various programs to instruct the new man in both theory and practical application, then illustrated the advancement of the electrician through the department to positions of greater responsibility and remuneration. On the subject of supervision, he stated that the major purposes of the program were to improve communication between the various levels of supervision, to develop ideas and recommendations to be referred back to top management, and to improve supervisory techniques.

Mr. Oren's talk was followed by a panel discussion of Lubrication under extremes of load, temperature, speed, contamination and hydraulic pressure. Included on this panel were Dr. M. E. Merchant, chief physicist of Research

**When Life's at  
Stake Rely on...**

**KLEIN**



Show the familiar Klein trademark to the old-timer on the pole and he'll tell you—"that's the equipment I've been using ever since I was a grunt."

Yes, workmen just naturally feel safer when the equipment is Klein—recognized for quality "Since 1857."

**ASK YOUR SUPPLIER**  
Foreign Distributor: International  
Standard Electric Corp., New York.



Write for your free  
copy of the Klein  
Pocket Tool Guide  
today!

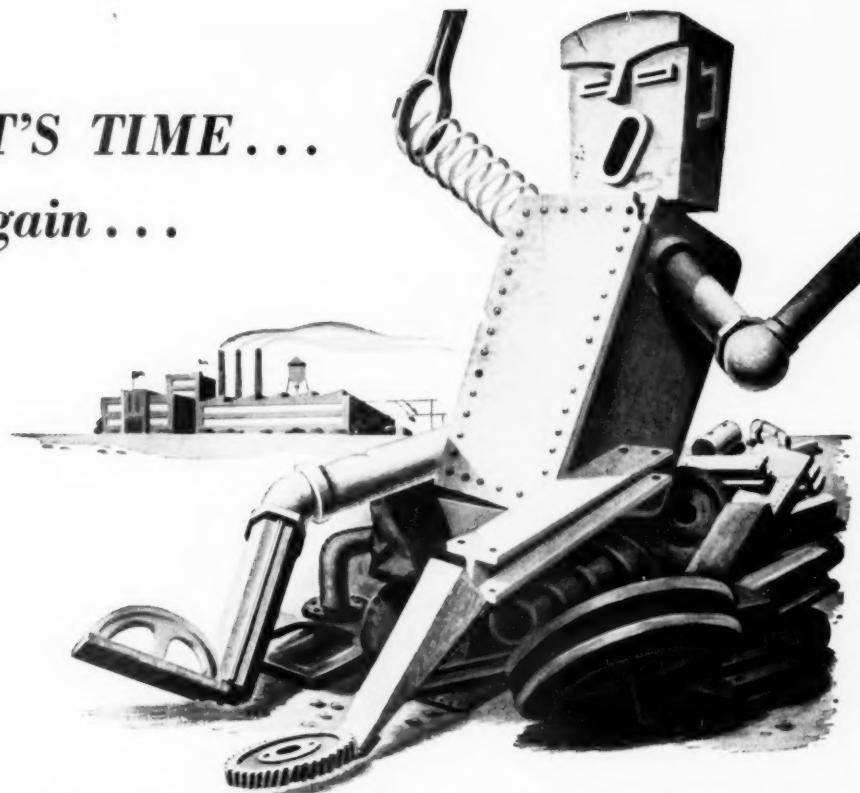
Since 1857



**Mathias & Sons**  
Established 1857      **KLEIN** & Sons  
3200 BELMONT AVE. CHICAGO 18, ILL  
Chicago, Ill. U.S.A.

IT'S TIME . . .

*again . . .*



## TO WAKE UP SCRAPPY!

Scrap's getting scarce again . . . compared to the amounts we need . . . and it's up to *all* of us to *help* produce enough steel.

107,000,000 tons of steel is the present rate of production in 1951 . . . 119,500,000 tons is expected in 1952.

Last year, 1950, we produced 97,800,000 tons.

All that extra steel—enough to take care of *both* military and civilian needs—calls for *more scrap iron and steel*.

### Scrap Inventories Are Alarmingly Low

While steel mills are producing at a greater rate than ever, scrap inventories have dwindled. Many mills are operating on a hand-to-mouth basis with shut-downs.

### NON-FERROUS SCRAP IS NEEDED, TOO!

*This advertisement is a contribution, in the national interest, by*

**McGRAW-HILL PUBLISHING COMPANY, INC.**

330 WEST 42nd STREET

NEW YORK 18, N.Y.



threatened unless we furnish more scrap.

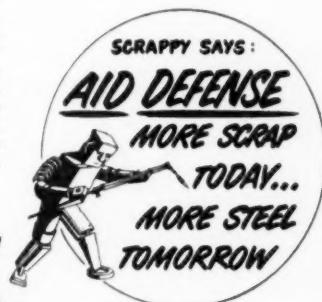
We *do* have the scrap. It's everywhere, not just in the form of *production* scrap—the "leavings" of machining, normally turned over to scrap dealers . . . but also in the form of *idle* metal: obsolete machines and tools, no-longer-usable jigs and fixtures, gears, chains, pulleys, valves, pipe, abandoned steel structures, etc.

We must have this *idle* metal to keep the furnaces running.

Please cooperate. Set up a Scrap Salvage Program in your plant—*now*. For a complete plan on "how to do it", write for booklet "Top Management: Your Program for Emergency Scrap Recovery". Address Advertising Council, 25 W. 45 Street, New York 19, N.Y.

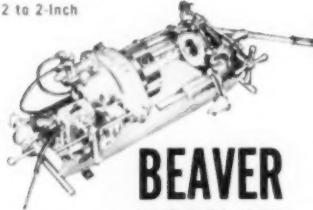
### Why Do We Need Scrap?

Steel is made half from pig iron, half from scrap. With production on the increase, more scrap must be purchased. And it's up to you to "dig it out" and sell it.



PRICE \$385.00

1/2 to 2-inch



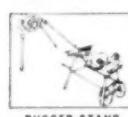
## BEAVER MODEL "E" pipe and bolt machine

• Cuts, threads and reams all kinds of pipe from  $\frac{1}{2}$  to 2 inch. With a drive shaft and geared tools cuts and threads pipe up to 8 inch. Cuts off bolts and rods up to 8 inch. Threads bolts and rods to  $1\frac{1}{2}$  inch in one cut; up to 2 inch in two cuts.

Write Beaver for detailed bulletin—or order through your supply house!

"Over 50 Years of Friendly Service"

BEAVER PIPE TOOLS  
282-300 Dana Ave.  
Warren, Ohio, U.S.A.



**PURCHASING AGENT** for Ets-Hokin & Galvan, San Francisco, is W. C. Rodgers, who has been with this company for over 28 years. In these days of materials shortages and priorities, buying for his firm's electrical contracting and motor repair service business in San Francisco, Oakland, Monterey, Los Angeles Harbor, Stockton and San Diego offices keeps him busier than ever.

and Development for the Cincinnati Milling Machine Co., Cincinnati, Ohio; Dean M. Cleveland, lubrication engineer for Bendix Products Div., Bendix Aviation, South Bend, Ind.; Charles E. Bailey, lubrication engineer for United States Steel in Pittsburgh, and M. A. Hayden, general sales manager, Waterbury Tool Div., Vickers, Inc., Detroit.

Manly Fleischmann, in his banquet address, mentioned that metal supplies for maintenance and repair of existing machinery for the second quarter of 1952 will amount to an estimated 2-million tons of steel, 100-million pounds of copper products and 4-million pounds of aluminum. "Discarded machinery can only be counted as a loss in money, metal and manufacturing time," he said, "so it is logical that our conservation practices must extend to the machines with which the products are made as well as the product." He urged the continuation and expansion of conservation and substitution measures wherever possible in order to conserve metal supplies, and urged the group to help locate industrial scrap, both ferrous and non-ferrous.

In reviewing the tight metal supply situation which will prevail through the next nine months, Mr. Fleischmann emphasized that (1) a huge \$6-billion military construction program has been placed on top of our already vast industrial expansion program, (2) since the supply of critical materials is not large enough to sus-

## U.S.I. SOUND POWERED assures dependable communication

### "BOMBS AWAY"

(in enemy language)

Could mean no communication in your plant . . .

Any communication system depending upon outside power supply is unusually vulnerable.

Investigate the permanent, or emergency, systems offered through U. S. I. sound powered telephones.

WRITE FOR CATALOG DEPT X

UNITED STATES INSTRUMENT CORPORATION  
SUMMIT---NEW JERSEY



HAND SETS

HEAD SETS



DESK-WALL  
SETS

port both consumer and defense-related programs, allocations are inevitable, (3) industrial expansion must be slowed down, (4) military construction will be spread over a longer period to flatten out the demand peaks, (5) housing starts are being reduced to conserve controlled materials used directly or indirectly for utilities and heating appliances, and (6) consumer goods and autos will be cut back about 10% for 2nd quarter allocations.

The enthusiastic attendance and participation in the show and conference showed the continuing interest in the subject of maintenance, for general attendance has climbed from 7500 to 10,000 to 14,500 over a three-year period while conference participation has jumped from 1300 to 1600 to 2100 during the same span. The 1952 conference was truly a specification job, with topics suggested by those attending former programs and sessions following a pattern of complete frankness and thorough analysis.

## NECA Protests Lower Home Copper Allotments

The National Electrical Contractors Association has suggested to the Housing and Home Finance Agency that if it persists in lowering the standard of electrical installations in homes that it require builders to inform buyers that the homes are not modern but are electrically substandard.

The HHFA is considering a further



**AN IDEA PAID OFF** for Carl M. Grubbs, president of Electric Tool Service Co., Louisville, Ky. Four years ago he started repairing all types of electric tools for Louisville industries; today turns out more than 350 jobs per month for customers all over the U. S. and even from foreign countries.



## NEW CONSTRUCTION



## OR REMODELING WORK

*(and who can safely predict which will be more important in 1952?)*

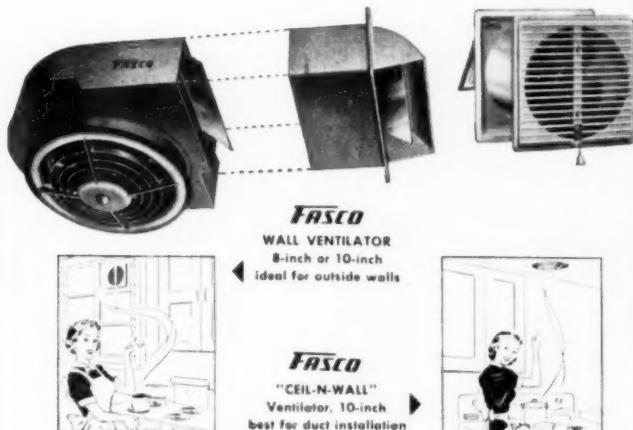
# FASCO VENTILATORS

**make either kind of job easier to sell**

In new-home promotion, Fasco Ventilators are one of the perfect "extra touches" which makes house-hunters, especially women, decide on your homes against others lacking such conveniences.

In remodeling work, your customer's mind is already set on modernization—and it takes only a suggestion to add Fasco Ventilators, too—for extra profit on the job.

Fasco Ventilators, to be backed by consumer advertising in 1952, are the industry's acknowledged leaders. Ask famous Levitt & Sons or any builder who has installed them—or write for Bulletin CM 45. You be the judge!



formerly F. A. SMITH MFG. CO., INC.  
**FASCO** Industries, Inc.  
ROCHESTER 2, N. Y.

# magno-tronic

DUAL SILVER POINT — FULLY AUTOMATIC  
FLUORESCENT STARTERS

-completely eliminate  
annoying blinking  
and flickering of dead  
fluorescent lamps!

## GUARANTEED — FOR ONE YEAR!

This is a glow switch condenserless precision starter equipped with automatic thermal relay circuit breaker. The relay automatically removes the lamp from the circuit electrically when the lamp becomes deactivated and automatically resets upon interruption of the lamp circuit.

**SIMPLIFIES** — Replacement of defective lamp automatically recycles starter circuit. No buttons to push — no replacement of starters.

**REDUCES COST** — Magno-Tronic starters provided exact timing of electrode heating, preventing excessive ions of emission material, thus assuring maximum possible lamp life.

**VERSATILE** — Built to operate efficiently over an extended voltage and temperature range.

Demonstration and Literature on Request.



SP-15-20 For use with 15 or 20 watt lamps.

SP-30-40 For use with 30 or 40 watt lamps.

SP-85-100 For use with 100 watt lamps.

Manufactured under  
U. S. PATENTS

2298236 2159827 2339307  
2336935 2239244 2332694  
2341520 1849552

Other Patents Pending

**WEST COAST MEMBER** of the Electrical Contractors Industry Advisory Committee, established by NPA to advise government on electrical construction problems, is Charles A. Langlois (right), San Francisco electrical contractor shown here with his son William.

reduction in the allowable amount of copper wire that builders can self-certify. Present allowable amount is 35 pounds per house which amount, NECA contends, is just enough to permit a proper installation in a small house. NECA was critical of the home copper limitation program being imposed under the guise as a metals conservation measure. The Association points out that the provision of adequate electrical systems in a million homes would require scarcely more than one-half of one per cent of the available 1952 supply of copper mentioned in official DPA estimates. It contended that this tiny amount could not possibly affect the mobilization program.

DPA recently announced that no more than about 600,000 new housing starts could be programmed for 1952 because of the acute copper shortage. Home builders immediately commenced seeking means of reducing the amount of copper so as to get authority to build more homes, there being a surplus of most building materials and construction labor in many areas. NECA's objection to schemes to bring this reduction about was made in a memorandum to the HHFA from E. R. Cornish, director of the NECA Research and Education Department.

Commenting on the situation, the Association said:

"Perhaps no more glaring example of the futility of economic controls in the hands of bureaucracy exists than the continuing effort to reduce the use of metals in home electrical systems. When those efforts react to the detriment of the electrical industry and the public, NECA has objected, is objecting, and will continue to object. It is a fraud upon the public to represent electrical deficient homes as modern."

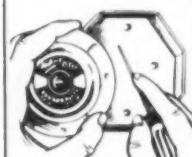


INDUSTRIAL ELECTRONICS CORP.

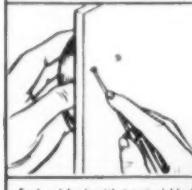
General Offices & Main Plant, 50 BANK STREET, NEWARK 2, N. J.



Open back models designed for simple bracket mounting on strap or chassis.



Enclosed back with adapter plate suitable for direct mounting on a 4" round or octagonal box.



Enclosed back with terminal block for screw connections.

NEW

## MIDGET BELLS



SMALL SIZE...  
LOUD RINGING

By the ORIGINATORS of UNDERDOME Bells "Slow stroke" action plus prolonged vibration of bell shell results in a greater sound carrying power and clear, distinctive tone greatly superior to the buzzer-like action of ordinary bells. Only one moving part (the plunger) minimizes wear. Polarized ... no contacts to spark, arc, stick or wear. 2 1/2" or 3" diameters, with adapter plate for mounting on standard outlet boxes. Also available in a variety of mounting arrangements and finishes for use as components on original equipment. Write for literature MB-4.

Sold through Electrical Wholesalers

Wheeler

SIGNALS

SIGNAL  
ENGINEERING & MFG. CO.  
154 WEST 47 ST. NEW YORK 18, N.Y.

## Tool Exhibit To Be Held In Boston

The Massachusetts Electrical Contractors Convention Authority Tool Exhibit will be held at the Bradford Hotel in Boston, Mass., on April 16 to 18. The exhibit will not be confined to electrical tools but is designed to show any tool or instrument peculiar to the building construction industry. The exhibit is under the auspices of the Massachusetts Electrical Contractors Association, Inc., and the New England Chapters of the National Electrical Contractors Association.

The Tool Exhibit is being held at the same time as the Electrical Trade Show, sponsored by the Electrical Manufacturers Representatives Club of New England.

## NISA News

The Quaker City Chapter, NISA meeting was held December 12th, 1951 at Beck's on the Boulevard, Philadelphia. Roll call showed 45 present. President Wagner, presided. The speaker of the evening, Norman Rollston of the Hunter Mfg. Corp. of Bristol, Pa., was introduced and his speech revolved around the manufacture and loading of explosives in the present day modern plant.

• • •

The November meeting of the Niagara Chapter, Buffalo, N. Y., was held November 9, 1951 at Niagara Hotel, Niagara Falls, N. Y. Thirty-three members were present, including several guests from other chapters.



**YOUNGEST MEMBER** of NECA Chapter in Portland, Oregon is Adams & Rankin Electric Co., a partnership comprised of Noel O. Rankin (left) and Leslie C. Adams. Believers in quality work at fair prices, Adams & Rankin specialize in industrial and commercial work and in new and relighting installations which they promote vigorously.



**PORTABLE GREENLEE HYDRAULIC BENDER  
HELPS BEEMSTER ELECTRIC COMPANY DO PRECISE WORK,  
SPEED JOBS, SAVE HARD-TO-GET MATERIALS**

On its first big job for the Beemster Electric Company, Green Bay, Wisconsin, the **GREENLEE** Bender more than proved its worth.

As reported by C. M. Peot, Beemster's manager, their bender at times was taken 200 feet in the air to make "on location" conduit bends atop a large storage elevator. This eliminated need for many manufactured bends, or taking time out for custom bending . . . and, most important, resulted in getting accurate bends that could be fitted in exactly as needed!

Besides the portability feature of the **GREENLEE**, this contractor also points out that the ram measurement markings let you gauge bend

radius accurately for making exactly matching bends. And changes from one pipe size to another are made easily, quickly.

Let the one-man-operated **GREENLEE** speed and simplify your jobs, too. In minutes makes smooth, accurate bends in pipe up to 5", rigid and thin-wall conduit, tubing, bus-bars. Often pays for itself on the first job. Write for facts today. Greenlee Tool Co., 1742 Columbia Avenue, Rockford, Illinois.

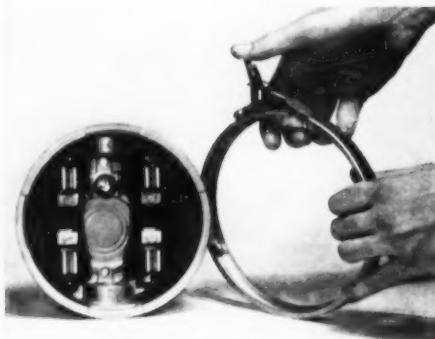


**OTHER GREENLEE TIMESAVING TOOLS FOR ELECTRICAL WORK**  
Hand Benders • Joist Bars • Cable Pullers • Knockout Tools • Auger Bits and Drills

# QUICK AND EASY TO INSTALL



## Standard Meter Sockets



**TYPE R FOUR-TERMINAL SOCKET** covers almost all types of single-phase metering applications or ratings. It's easily mounted, has roomy space for wiring, also liberal current-carrying capacity.

**QUICK-HITCH SEALING RING** requires no tools for installation. With a simple snap of the ring, socket and meter are as-

sembled. Socket with meter in place is sealed against the elements.

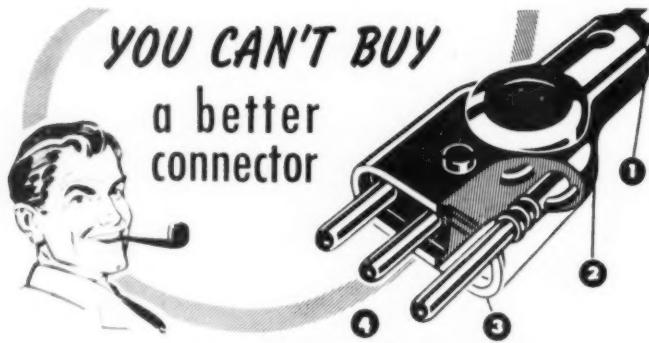
**LESS MAINTENANCE**, increased corrosion resistance, and longer life. Ask your **G E** representative for full details or write for bulletin GEA-5147, Sec. 601-50, General Electric Company, Schenectady 5, New York.



**LACK OF COPPER** and its effect on the electrical industry is a serious problem, it was agreed by Jack Barter of Fostoria Pressed Steel Co., Fostoria, Ohio and R. D. Miller, Square D Co., Pittsburgh, during the Industrial Electric Exposition in Pittsburgh last fall.

B. Fuller, of the U. S. Corps of Engineers, gave a talk illustrated with charts and diagrams of the history of the development of hydro power at Niagara Falls. Several plans for increasing the amount of power produced at Niagara Falls were described, especially in terms of our international agreements with Canada.

**GENERAL ELECTRIC**



**... AND HERE'S WHY**

- (1) Sturdy one piece cable connector assemblies
- (2) Safe, long lasting resilient Neoprene jacket
- (3) Water seal prevents moisture infiltration
- (4) Contacts firmly embedded in connector body

Write for your **FREE** copy of JOY connector bulletin MC-108, now!

More than 100 Years of Engineering Leadership M.E. 1151.2

**JOY MANUFACTURING COMPANY**

HENRY W. OLIVER BUILDING, PITTSBURGH 22, PENNSYLVANIA  
IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LTD., GALT, ONTARIO

The regular December meeting of the New York Metropolitan Chapter was postponed. Instead, on December 8, an all-day inspection trip and open house were sponsored by the downtown group of 10 members—Brownell Distributors, Chiswick Elec. Motor Co., Consolidated Elec. Motor Co., Electric Enterprise Co., L. J. Land, Inc., Nanner Elec. Co., Premier Elec. Co., Schneider Elec. Co., Seagar Carbon Co., and Wurth Elec. Motor Co. This seems to be a very happy idea as reported by Meyer Friedkin:

All-day get-together was held at Consolidated Electric Motor Co., and more than 60 members were present. We were particularly happy to have our good friends Joe Wagner of Philadelphia and O'Day and Mortimer from Boston in attendance.

Many of our members were well impressed and benefited as a result of inspecting the improved shop facilities of Premier Elec. & Eng. Co., Elec. Enterprise Co., and Consolidated Elec. Co.

Puget Sound Chapter held its regular monthly meeting at the Mayflower Hotel, Seattle, December 4. Two films were shown, one on Jet Propulsion and one on Photographic Lighting. Follow-



**CHARTER NISA MEMBER** and one of the oldest private pilots in the U.S. are honors held by B. Shell (right), president of Guyan Electric Co., at Logan, W. Va., in the heart of the coal mining district. With his son Bernard, Jr. (left) he supervises a vast operation covering electric equipment repairs and resistor and starter manufacturing; frequently flies his own plane to NISA conventions.

ing the films Cal De Vere led an interesting discussion on customer relations.

• • •

Two Westinghouse color-sound films were shown to feature the Foremen's Meeting of the Central District Chapter on December 11. "The Banshee" showed the thrilling story of jet propulsion from development to flight. "Electrical Proving Ground" was a presentation of the development and tests of a wide range of power controls, from a tiny switch to giant circuit breakers.

Officers for next year are: President—J. G. Lessel, Central Motor & Repair Co.; Vice President—G. F. Glave, Chicago Electric Co.; Secretary—B. R. Holman, Holman & Hill, Inc.; and Treasurer—A. J. Jeffries, Bowers & Clark, all of Chicago, Ill.

• • •

The Los Angeles Chapter meeting was held on December 11 and Chairman William Hogue presided. He introduced two new members, William of Alexander William Co. and Don Magender of Electric Motor Sales & Service.

William Hill of Hill Electric was introduced as one of our first chairmen. Mr. Hill presented a gavel to our chairman Mr. Hogue. The gavel was a wunders mallet, very appropriate for a group of motor repairmen. Earl Swemhart, secy-treasurer, was called

When Worn Drills and Under-Size Holes Add to Your Anchoring Problems...

## Go on using that Worn Drill!



Yes, you can continue to use that very drill for the rest of its natural life, even when the holes drilled become alarmingly smaller than expected because of any change in dimension as the drill wears down.

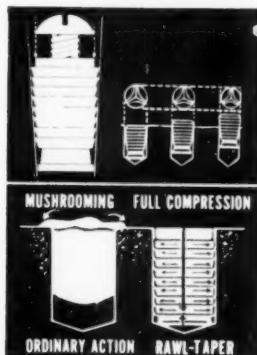
## RAWL-TAPERS



The RAWL-TAPER is a caulked lead machine screw anchor comprised of a lead sleeve with a series of progressively diminishing tapers. The base of the sleeve becoming gradually smaller than the top permits the RAWL-TAPER easy entry into such under-size holes as long as they are large enough for the hard conical nut to enter. The distributed force of caulking throughout the entire length of the lead sleeve is accomplished through the partial collapse of each of the diminishing tapers, causing them to fold under each other and maintain full compression between the threaded nut and the masonry for the maximum in holding power.

**It's the TAPER in RAWL-TAPERS that does it!**

**Remember... RAWL-TAPERS were Designed...**



...to meet any variation in the diameter of the hole caused by changes in dimension of the drill as it wears down, *thus saving the cost of new drills*.

...to insure a uniform expansion of the lead for the length of the nut... supplying maximum area in engagement with the masonry.

...to overcome the tendency of lead to cling to the surface of the hole and mushroom, which builds up resistance and limits the depth of caulking between the nut and masonry.

...to avoid increasing the diameter of the lead which would require a larger diameter hole and in turn would reach the minimum limit when too small to receive the nut.

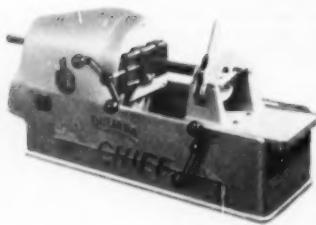
...to eliminate the poor practice of increasing the thickness of the lead sleeve beyond a certain ratio in proportion to the base diameter of the nut, which would be drawn up through the lead as soon as the anchor received any strains beyond the normal elastic limit of the lead.

For further information write Dept. E

12-L-2

**THE RAWLPLUG COMPANY, INC.**  
271 CHURCH STREET • NEW YORK 13, N. Y.

THERE ARE RAWL... EXPANSION BOLTS, SCREW ANCHORS AND MASONRY DRILLS FOR EVERY NEED.  
SOLD THROUGH ALL LEADING HARDWARE, ELECTRICAL AND MILL SUPPLY HOUSES



## TWO QUIJADA PRODUCTION COST REDUCERS

### QUIJADA CHIEF PIPE AND CONDUIT THREADER

Threads, reams and cuts pipe or conduit faster than any power threader you've ever seen... 2" pipe or conduit COMPLETE in just 32 seconds! The only threader with completely automatic chucking. Just a pull of the switch to chuck and a push to un chuck.

IT'S PORTABLE TOO! Weighs only 160 pounds. Take it right on the job. Use anywhere there is power.

SEE YOUR JOBBER

OR WRITE FOR MORE

INFORMATION TO Dept. EC2

### E-Z CUTTER

The only cutter with power driven rollers. Cutter always cutting, never slipping. Easily 500 cuts to a sharpening. The light weight makes a power cutter feasible right on the job. Weighs only 100 pounds—yet easily cuts up to 4 inch pipe or conduit.

QUIJADA TOOL CO., INC.

5474 ALABAMA AVENUE  
Los Angeles 22, California

be modern | go

# ILSCO

• 80 - page  
manual yours for  
the asking



XT  
MODEL  
6 SIZES  
14-300 MCM

ILSCO CONNECTORS  
famous for performance  
U/L TESTED

# ILSCO

COPPER TUBE AND PRODUCTS, INC.

5741 MARIEMONT AVE. • CINCINNATI 27, OHIO

upon to talk on prospective memberships, after which he read a letter giving the highlights on a recent visit to local NPA office.

The chairman then relinquished the gavel to Vice Chairman Pompey for the education feature of the evening introducing James E. Mason of Los Angeles Trade Jr. City College. His topic was training for Electric Motor Repair Industry and what they can do to help. His talk was followed by a motion picture showing the activity at the college in both night and day classes. Discussion by members followed.

• • •

The fourth and regular quarterly meeting of the Mid-South Chapter of NISA was held at the Muscle Shoals Hotel, Sheffield, Alabama on December 8, with 54 members and guests in attendance.

A trip by bus was made to the plant of Reynolds Metal Company, from there to TVA power shop and then to the dam site.

Returning to the hotel, lunch was served. After lunch George Cottrell, our host, formally called the meeting to order and extended to all a most cordial welcome. He then introduced Harold Adams of the Reynolds Metal Co. who gave a very interesting talk on aluminum magnet wire.

The meeting was then turned over to F. W. Steffner who declared the meeting open for business session.

Meeting minutes of September 15, 1951, at Knoxville, Tennessee were read by Murphy G. Miller, Secretary, and approved.

The application of A. S. Brown, Jr., for regular membership of Electrical Repair & Service Co., Birmingham, Alabama, was presented and approved.

The application of John L. Waites for regular membership of Waites Electric Co., Montgomery, Alabama, was presented and approved.

H. E. Grant, Chairman of the Nominating Committee, gave the report for that Committee and recommended the following for 1952 officers: William J. Howard, Standard Electric Co., Montgomery, Ala., for President; Thomas M. Russell, Russell Electric Co., Inc., Mobile, Ala., for Vice President; Murphy G. Miller, Sr., Tennessee Electric Motor Service, Knoxville, Tenn., for Secretary-Treasurer; Paul Bonham, Tri-State Armature & Electric Wks., Memphis, Tenn., a Director; and F. W. Steffner, Southern Armature & Motor Wks., Knoxville, Tenn., Retiring President, a Director.

J. C. Campbell moved that the committee's report and recommendations be adopted and that nominations be closed. Motion was duly seconded and unanimously passed.



**KEEPING PACE WITH THE TIMES** is a snap for Richard (Dick) Arbogast, Newberry Electric Co., Los Angeles. Shown here at his headquarters (Los Angeles) office an hour after his return from a recent trip to the East, he is elbow deep in mail relating to jobs in progress all the way from Alaska to Chile, including many military and AEC projects throughout the Southwestern United States.

President Steiner called for invitations for the next meeting. The vote was in favor of Nashville and March 15, 1952 date was set.

Ed Grant, Chairman of the National Publicity Committee told of the work his committee was doing and displayed the NISA decals and explained how they could be used as a good publicity item. Ed Grant also extended an invitation to all present to attend the Southeastern Chapter Meeting to be held next October 24 and 25, 1952, in Miami, Florida.

Selden High, National Membership Chairman, talked on new members explaining that there is still a large number of shops that should be in the association.

• • •

The dates of the 1952 NISA Convention are April 20-23. The place will be the Conrad Hilton Hotel (formerly The Stevens) in Chicago.

The program provides the President's Reception on Sunday evening, with the technical program including more forum sessions and free time to follow on Monday, Tuesday and Wednesday. The inspection trips will be deferred until Thursday. Exhibits will be open Monday through Wednesday.

The Convention Committee plans to offer on Wednesday night the feature of "Exhibitors Night." Music and refreshments will be provided in the ample space left vacant at the back of the hall.

From Walter J. Prise, The Maintenance Co., New York, N. Y.

# Displays...and sales...come to life with **AMPLEX SWIVELITES**



In the show room of Silvestri Art Mfg. Co., Inc., display manufacturers in Chicago, Amplex Swivelites have brought extra lighting efficiency and dollar savings.

**DISPLAY MATERIAL** . . . just like other merchandise . . . looks better and sells faster when effectively highlighted. And for really superior, economical accent lighting there's nothing like Amplex Swivelites.

Swivelites are smart and modern in design . . . made of aluminum with a permanent satin finish. Their airflow ventilation prolongs lamp life. Their special double-ball swivel gives instant, positive, fingertip control. Every basic unit in their construction is interchangeable with every other . . . arranging new lighting effects is quick, easy and inexpensive.

For today's outstanding buy, send for the whole Amplex story! Just write Amplex Corporation, Dept. C-2, 111 Water St., Brooklyn 1, New York.

## OTHER AMPLEX LEADERS



Reflector  
Spots and Floods



Street Lighting and  
Traffic Signal Lamps



Colorbeam  
Reflector Lamps



'Hi-Hat' Recessed  
Fixtures



Hi-Bay Reflector Lamps



Outdoor  
Weatherproof Lamps



Industrial Infra-Red  
Lamps

# AMPLEX

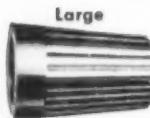
Sealed-Bean Reflector Lamps, Colorbeam Lamps, Spotlights and Floodlights, Industrial Infra-Red Heat Lamps, Vibration and Rough Service Lamps, Street Lighting Lamps, Traffic Signal Lamps, Incandescent Lamps, Fluorescent Tubes, Display Accessories.

# AUSTIN "SCREW-ON" CONNECTORS

Licensed under United States  
Letters Patent No. 1,933,555



are faster,  
safer and  
neater—



Large



Standard



Small



Midget

## NO SOLDER, NO TAPE, NO ADDITIONAL TOOLS

The Austin Screw-on Connector is a molded phenolic plastic shell with a copper coated spring inserted *after* molding. Provides 25% lower electrical resistance and up to 3 times the tensile strength.

Just strip the wires, insert into connector, and twist. The spring expands and rolls a thread onto copper conductors. When you stop twisting, the spring tightens down and grips conductors firmly. Connector is skirted so insulated portion of wires is drawn up into connector for complete insulation.

Write for Information and Prices



**PRESIDENT** of the Portland, Oregon Chapter of NECA is W. R. Grasle, shown here with W. R. (Reed) Grasle, Jr., his son, who handles government priorities and regulations for their electrical contracting firm in Portland which bears his own name.

## W. J. Barnes Elected President New Orleans Electrical Association

Walter J. Barnes has been elected president of the Electrical Association of New Orleans, Inc., succeeding Hutson Colcock. Other officers elected included: J. R. Guidroz, executive vice-president; James N. Roos, Hicks L. Youngs, Edward H. Brignac, Joseph M. Supple and Al LaBiche, vice-presidents; W. E. Clement, publicity director; Eugene H. Mowen, secretary, and L. W. Tufts, treasurer.

Executive committee members elected were W. P. Massey, Robert Brugier, E. N. Avengo, A. A. Demarest, C. C. Longwith, Al Levin, W. C. Murphy, Mr. Barnes, A. B. Paterson, Jr., and Mr. Colcock, ex officio.

## THE M. B. AUSTIN COMPANY NORTHBROOK, ILLINOIS

FOR COMPLETELY RELIABLE  
TIME SWITCHES

Be Sure You Specify

# PARAGON!

On any application . . . controlling yard or remote building lights . . . operating motors, stokers, burners or other industrial equipment . . . the time switches you use must be reliable. That's why it's smart to use Paragon's built-in accuracy and reliability.

Available in a wide variety of types and models for all "ON and OFF" timed-switching operations — indoor or outdoor. Time switches . . . interval timers . . . 7-day program controls . . . cycle repeaters . . . time-delay relays and reset timers . . . there's a dependable Paragon Time Control to fit your needs. 300 Series from \$10.50 list.



Illustration shows Model 301, straight "ON and OFF" Time Switch for use where two or four operations per day are required. Self-starting, heavy-duty motor available in 115 or 230 volt, SPST, SPDT and DPST models.

SEE YOUR JOBBER OR WRITE FOR INFORMATION AND CATALOG

## Paragon ELECTRIC COMPANY

1614 TWELFTH STREET  
TWO RIVERS, WISCONSIN

WORLD'S LARGEST EXCLUSIVE MANUFACTURER  
OF TIME CONTROLS FOR ALL USES

## Chicago Groups Elect '52 Slates

Year-end elections brought new faces into the official families of two Chicago electrical groups—the Cook County Electrical Contractors Association, and the Electric Motor & Service Association (Central District Chapter, NISA).

The following members took office at the annual installation meetings held in January:

CCECA—President—Abe Sluis, Sluis Electric Co.; vice-president—A. A. Wohlgezon, Builders Lighting Fixture Co.; secretary—Joseph Turek, Jr., Avers Electric Co.; treasurer—Erwin Kaufmann, Kaufmann Electric Co. New members of the Board of

Directors are: Paul Marten, Sivert Electric Co.; Louis Matson, Active Electric Co.; Arthur L. Simons, Clark Electric Co.; and Clifford L. Zingraf, Chicago Square Z Electric Company.

EMSA—President—J. G. Lessel, Central Motor & Repair Co.; vice-president—G. F. Glave, Chicago Electric Co.; secretary—B. R. Hohman, Hohman & Hill, Inc.; treasurer—A. J. Jefferies, Bowers & Clark. New directors chosen to serve for a 3-year term are: B. Ferrari, Jr., Excel Electric Service Co., Inc.; and A. Pawlicki, Hygrade Electric Company.

## NECA Quad-Cities Chapter Officers Elected

At the January meeting of the Quad-City Electrical Contractors Association, Rock Island, Ill., the following officers were elected to serve for the ensuing year: President—Frank B. Delihery, Delihery Electric Company, Davenport, Iowa; Vice-President—G. O. Farlow, Farlow Electric Co., East Moline, Ill.; Secretary—Bessie S. Jensen, Rock Island; Treasurer—W. J. McNealy, Electric Construction Company, Rock Island; and member of NECA Board of Governors—Lloyd W. Zeng, Leithner & Weishar, Rock Island.

## Atomic Labor Relations Panel

The atomic labor relations panel is hopeful that an end has come to the numerous strikes of construction craft workers that have hit the \$500-million gaseous diffusion plant under construc-



**A BIG JOB** gets attention of (L to R) Don G. McKeen, manager; and R. J. Barnes, president, Barnes & Brass Electric Co., electrical construction and motor repair firm of Clarksburg, West Virginia.

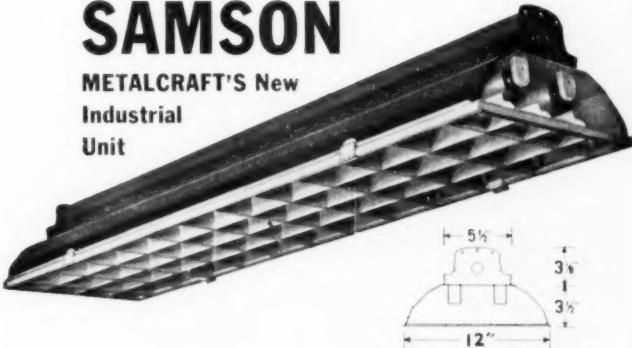
# Are you operating on a cost **PLUS** basis?



WHEN you buy or sell industrial lighting fixtures on the basis of the price tag alone, you're likely to discover *plus* costs later that more than offset any initial saving—the *plus* costs of extra maintenance, wasted current, and earlier replacement. Don't buy lighting fixtures in the dark—get the facts and you'll agree: the best way to keep *plus* costs out of the picture is with the

## SAMSON

METALCRAFT'S New  
Industrial  
Unit



Ruggedly built of heavy gauge steel, die-formed for uniform construction. Quarter-turn "Shakeproof" wing nuts for easy installation and removal of reflector. Fluorescent or slimline, 2-or-3-Lamp conventional or turret sockets. Porcelain enamel or baked enamel finish. Shielding assembly optional.

**WRITE FOR NEW BULLETIN No. SN-1051**



**METALCRAFT PRODUCTS CO., INC.** • Manufacturers of  
Fluorescent and Slimline Luminaires • **Mascher & Lippincott Sts., Phila. 33, Pa.**



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FOR ALL TYPES  
OF MASONRY



ARRO FLEXO-FLUTE SPIN DRILL  
Cemented carbide tips. Cleans  
dust from holes automatically.



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ARRO 3-FLUTED DRILL POINT  
Type 200



ARRO 4-FLUTED DRILL POINT  
Type 300



ARRO TWIST DRILL POINT  
Type 100



RUBBER GRIP DRILL  
POINT HOLDER  
FOR TYPES 100, 200 and 300  
DRILL POINTS



PLAIN STEEL DRILL POINT HOLDER  
FOR TYPES 100, 200 and 300  
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ARRO offers a complete line of drills for masonry, especially designed for their specific jobs. Made of the finest materials and produced by skilled craftsmen. ARRO drills are conveniently available from your ARRO distributor.

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MARION, OHIO



IN CHARGE OF construction projects for Industrial Electrical Works, Omaha, Neb., is engineer-estimator Arthur D. Brown. An average installation crew of 85 men is kept busy on industrial, commercial and school jobs.

for the Atomic Energy Commission at Paducah, Ky.

The construction contractor, F. H. McGraw Co., and the AFL Building Trades Unions have signed a memorandum agreement providing for orderly handling of grievance disputes without walkouts.

As to larger disputes, the unions also expressed their intention to recognize the panel's authority over disputes at this project. This means that the 18 building trades unions will not authorize any strike without first utilizing the services of the panel.

## Lamp Makers Need Brass

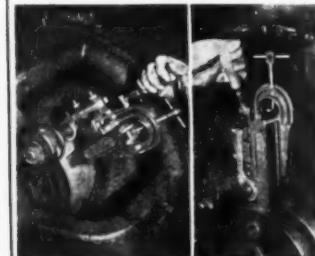
The Incandescent and Fluorescent Lamp Manufacturers Industry Advisory Committee recommended that an additional 313,000 pounds of brass be allotted for production of lamp bulb bases in the first quarter of 1952, during a recent meeting with the National Production Authority in Washington.

This additional poundage of brass would permit production of 36,000,000 bulbs, valued at \$4.5-million (net billing price), in addition to the 533,600,000 lamps, valued at \$66,700,000, which may be made with the 4,586,500 pounds of brass equivalent made available to the industry for the first quarter.

Harry J. Hollbrook, Director of NPA's Consumer Durable Goods Division urged the committee to speed

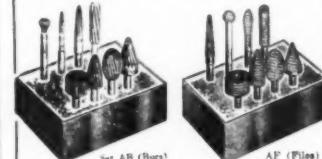
## MARTINDALE

COMMSTONE HOLDERS

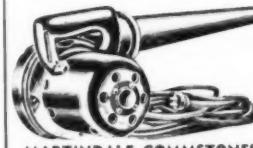


Hold Commstones rigid and true for concentric resurfacing of commutators and slip rings while running at normal speeds in their own bearings. Interchangeable boxes, 1", 2", and 3" wide handle grinding jobs up to 4 1/2" wide.

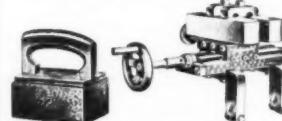
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### BLOWERS AND VACUUM CLEANERS



### MARTINDALE COMMSTONES AND COMMUTATOR GRINDING TOOLS



### MICA UNDERCUTTERS FOR SLOTTING COMMUTATORS Nine Motor Driven Types



### MARTINDALE PROTECTIVE MASKS Weigh less than 1/2 ounce



Write for 64-page Catalog describing these and many other products for Industrial Maintenance, Safety and Production.

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up conversion from brass to aluminum in lamp bases. He said that brass shortages are so extreme and demand for brass so great for defense needs that additional allotments for lamp bulb manufacture could not be expected.

First quarter allotments to the lamp industry, for bases and other uses, were 2,588,713 pounds of brass mill products and 992,257 pounds of aluminum, totalling 4,407,000 pounds of "brass equivalent" available for base manufacture in the first quarter.

Conversion to aluminum in place of brass in bases, at an average rate of one pound of aluminum to 1.9 pounds of brass, is under way on a number of lamp types, manufacturers said. NPA pointed to this expedient as the greatest possibility toward increased production, since aluminum supplies are expected to enlarge progressively in 1952.

Brass in Christmas lamp bulbs, photo-flash bulbs and fluorescent lamp tubes has largely been eliminated in favor of aluminum, the committee said.

The average quarter's production of lamps in 1951 approximates \$72-million or 618,200,000 units, using 4,994,000 pounds of "brass equivalent," NPA reported.

Small lamp manufacturers should receive preferential treatment in any NPA actions, the committee agreed. It was suggested, but not agreed to, that "small manufacturer" be defined in this industry as one who does less than 4% of the industry's business.

Lester W. Dettman of NPA's Consumer Durable Goods Division presided at this IAC meeting. Eleven committee members were present.



**AT THE DOORSTEP** of West Virginia's coal fields is R. C. Hart, owner of the Hart Electric Shop, Bluefield, W. Virginia. With 28 years experience in the motor repair business, Hart services equipment for coal mine operators in that area.

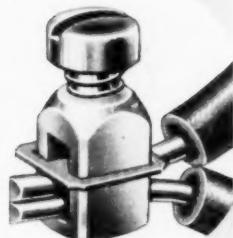
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EFFICIENT-  
ECONOMICAL!**

**BLACKBURN**  
*Building Wire*  
**CONNECTORS**

**Many Uses:**  
**IN JUNCTION BOXES**  
**FOR FIXTURE AND**  
**RANGE CONNECTIONS**  
**FOR MOTOR CONNECTIONS**

Quick and easy to install, yet connections can be changed without clipping pigtail. Only 3 sizes cover a range from No. 14 to No. 4 wires. Save labor—cost little—get some today.

**How to Order:**  
Cat. 10U for 2, 3 or 4 No. 14 wires  
" " " 2 or 3 No. 12 wires  
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" 6U " 2 or 3 No. 8 wires  
" " " 2 No. 6 wires  
" 4U " 2 No. 6 or 2 No. 4 wires



**JASPER BLACKBURN**  
**CORPORATION**

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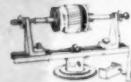
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**CROWN** motor repair shop equipment

**TIME-SAVERS TO CUT COSTS  
ON MOTOR REPAIR JOBS**



COIL WINDER  
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ARMATURE AND STATOR HOLDERS



GROWLERS



INSULATION FORMERS



COIL TAPPING TOOLS  
AND WEDGE DRIVERS

Shorten the time it takes to put a motor through the repair shop and you reduce costs or increase your profit margin on every job! Let CROWN Motor Repair Shop Equipment help you do it! Expressly designed by practical electrical men to increase shop volume and quality without increasing payroll. Every item in the CROWN Line has proved in actual shop practice to pay for itself many times over. Engineered to highest standards and economical in first cost.

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Standard's dry type load center transformers assure correct voltages at point of use. Installations are easily made and can be quickly relocated to conform to changing departmental requirements. Consult your Standard representative today. He can show you how Standard transformers save you money by assuring top performance from your equipment.

THE STANDARD TRANSFORMER COMPANY  
WARREN, OHIO • OFFICES IN PRINCIPAL CITIES



**SCARCITY OF COPPER WIRE** came in for serious consideration when M. W. MacIntire, Electric Repair & Service, Wilmington, N. C.; Ed Jenkins, Armature Winding Co., Charlotte, N. C., and C. A. Morris, Southern Electric Service, Charlotte, met in Raleigh during NISA's Southeastern Chapter meeting.

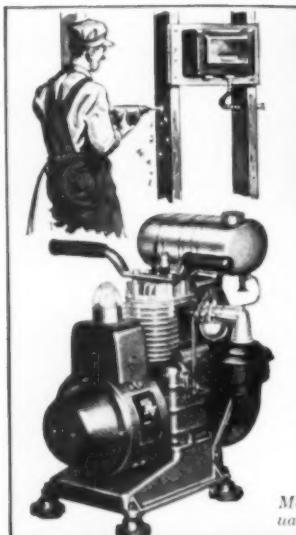
## Fluorescent Ballast Problems Discussed

Problems involved in conservation of copper through substitution of aluminum in fluorescent lamp ballasts and specialty transformers received full consideration at a recent joint meeting of the Specialty Transformer and the Fluorescent Lamp Ballast Industry Advisory Committees, held under the sponsorship of the National Production Authority in Washington, D. C.

Aluminum can be substituted for copper in ballasts and transformers, industry members told NPA, but problems encountered require further study. Chief difficulty to be overcome is the connection of copper leads to aluminum conductors, they said. This difficulty arises out of the fact that electrolytic action between copper and aluminum in the presence of moisture causes corrosion of welded copper and aluminum joints.

Several committee members said successful methods of joining copper and aluminum have been developed to overcome corrosion, and enumerated the following:

1. Covering the welded joint with varnish or glyptol lacquer to exclude air and moisture.
2. An ultrasonic welding method developed by the Mullard Laboratories in England in which high frequency sound waves generate bubbles in the molten solder, thereby preventing the formation of aluminum oxide during the soldering process.
3. A percussive electrical welding method used successfully in joining the ends of copper and aluminum wires wound on a motor and also in a labora-



## KOHLER ELECTRIC PLANTS *Independent Source of Electricity*

**PORTABLE**, low-cost model helps finish wiring, installation jobs faster. Operates electric drills, saws, other tools having universal (AC-DC) motors. Develops 1500 watts DC. Compact, reliable, weighs only 75 lbs. Handles for carrying. Other sizes 350 watts to 15KW, of various voltages in single and 3-phase models. Stand-by models, for protection of home, public and commercial equipment when central station service is cut off, from 750 watts to 15KW. Write for folder 13-F.

Model 1.5M5, 1500 watts, 115 volt DC. Manual control. Length 18", width 14", height 21".

Kohler Co., Kohler, Wisconsin. Established 1873

## KOHLER of KOHLER

PLUMBING FIXTURES • HEATING EQUIPMENT • ELECTRIC PLANTS  
AIR-COOLED ENGINES • PRECISION CONTROLS

tory electrical wire made up of short segments of copper and aluminum wire.

4. Silverplating the copper-aluminum joint.

Broad substitution of aluminum for copper wire presents problems because aluminum wire will not carry as much current as copper in electrical distribution systems and because the smaller diameters of aluminum wire tend to stretch when used for transformer windings, industry representatives pointed out.

One industry spokesman said his firm had cut its use of copper by about 17% through improvements in manufacturing methods, product redesign and substitution of aluminum for copper.

NPA said that copper would remain in short supply for five years or more, whereas increased supplies of aluminum may be expected early in 1953. Scarcity of copper is directly related to the heavy increase in military and defense-supporting requirements, NPA stressed.

Committee members told NPA that little if any conservation of copper is possible through simplification or standardization of lamp ballasts.

One committee member pointed out that further investigation should be made of the possibility of using copper covered steel wire as a conservation measure in ballast lead-in wires. It is estimated that the industry uses about 100 million feet of lead-in wire annually.

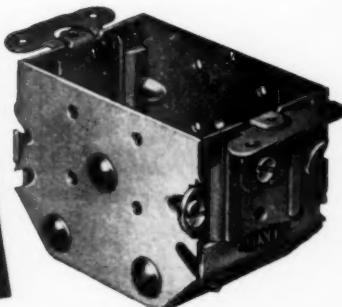
NPA informed the Fluorescent Lamp Ballast Committee that the estimated proposed shipments of the fluorescent lighting fixture industry is approximately twice that of the highest quarterly shipments made during the CMP base period (July 1, 1949 to June 30, 1950). Shipments for the highest quarter in the base period are estimated at \$24-million and for the 3rd quarter of 1951 approximately \$55-million. Fourth quarter 1951 proposed shipments are estimated at \$60-million, and first quarter 1952 proposed shipments at \$55-million.

The committee estimated that the 1952 requirements of ballasts for fluorescent lighting equipment would equal that of 1951 total requirements.

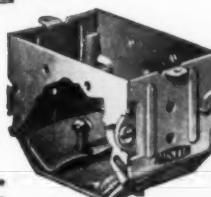
The Specialty Transformer Committee reported that they are not encountering any particular difficulties in obtaining most materials, but that nickel alloys and heavy wire are difficult to get. Most transformer manufacturers are operating at about 80% of capacity, the committee said.

M. E. Robertson and J. H. Brundage of NPA's Electrical Equipment Division presided at this joint Industry Advisory Committee meeting.

## AUSTIN'S Improved LR BOX



**Nails to Studding  
Evenly, Accurately,  
in a Matter  
of Seconds ...**



For use in Old  
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### Faster Installation!

Nail holes in box sides provide fast, easy installation. Saves money by eliminating bracket. Nail heads driven in tight—box is never out of line.

### Perfect Alignment!

3 nubs facing outward on each side of box prevent box from tilting. First nub is  $\frac{7}{8}$ " from front of box to permit adjustment for wallboard or plaster.

The M. E. Austin Company  
NORTHBROOK, ILLINOIS

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### OSTER No. 422 POWER VISE STAND

Low price of this portable power drive for hand pipe tools frees it from present government restrictions on higher priced equipment. Remember—this is the ORIGINAL portable power drive imitated but never equalled. It's

the ONLY machine of its type  
with the exclusive "AUTO-GRIP"  
semi-automatic front chuck.

Standard range  $\frac{1}{8}$ " to 2"  
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information.



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 Rush names of Oster Distributors in our area.

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sistant manager of sales at Philadelphia.

Century Electric Co.: The Harry Alter Co., Inc., New York City, motor parts distributor.

#### SOUTH ATLANTIC

Hyster Company: Jack Cairns, Brookhaven, Georgia, district manager for parts of Florida, Alabama, North Carolina and Georgia.

Sepec Corporation: W. H. Lassiter Sales Co., Richmond, Va., representative for Virginia and the Carolinas; Hairston & Company, Atlanta, Ga., representative for Georgia, Florida, Alabama and Central Tennessee.

Fairbanks, Morse & Co.: W. B. Wylie, manager of the Atlanta, Georgia, branch.

#### EAST CENTRAL

General Electric Company: C. S. Jones, Chicago, Ill., district representative for the Construction Materials Division, wiring devices.

American Steel & Wire Div., U. S. Steel: Fred L. Nonnenmacher, manager of the Chicago district sales office; S. W. Goodenough, Chicago, Ill., manager of the manufacturers products sales department.

General Electric Company: Charles W. O'Donnell, Cleveland, Ohio, district manager for the small appliance division.

Century Electric Co.: The Harry Alter Co., Inc., Chicago, Ill., distributor for motor parts.

Fairbanks, Morse & Co.: Milo C. Roy, manager of the Chicago branch office.

#### WEST CENTRAL

Graybar Electric Company: S. M. Lawrason, manager of the Baton Rouge, La., branch.

General Electric Company: J. R. Conley, Minneapolis, Minn., district representative for the Construction Materials Division, wire and cable.

Fairbanks, Morse & Co.: Clifford J. Schroer, manager of the St. Louis branch office; L. A. Weom, manager of the St. Paul, Minn., branch office; J. W. Wright, manager of the Omaha, Nebr., branch office.

#### WEST

Westinghouse Electric Supply Co.: G. M. DeKraker, manager of the new office and warehouse in Albuquerque, N. M.

Perfex Corporation: Idwal W. Parri, district manager of sales and service in Portland, Oregon.

The Black & Decker Mfg. Co.: Waldo E. Bair, Los Angeles, Calif., branch manager; R. A. Lomas, service engineer in charge of the new sales and service branch, Los Angeles.



## SOLDERING HEATING BRAZING

### Prest-O-Lite 5-in-1 Precision-Control Outfit

Trade-Mark

Four stems and soldering copper cover every electrical job, from heavy soldering or heating to wire splicing or finest work on delicate instruments... Burns "Prest-O-Lite" Acetylene, from handy, small tanks, at automatically regulated, constant pressure... Needle valve flame adjustment... Full heat (2,800 deg. F.) instantly, without pumping, priming, or warmup... No smoke or fumes... Light and easy to handle.



Precision Model . . . . . \$22.50

Standard Model . . . . . 16.50

Ask your jobber or write us for more details. Linde Air Products Company, a Division of Union Carbide and Carbon Corporation, 30 E. 42nd St., New York 17, N. Y.

The term "Prest-O-Lite" is a registered trade-mark of Union Carbide and Carbon Corporation.

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*Carry WATER, GAS  
AIR LINES, CABLE  
at any angle to beams*

**"EFFICIENCY"  
CONDUIT  
HANGER  
"TYPE F"**

On open steel construction, Efficiency "Type F" Conduit Hangers are your best choice for carrying  $1\frac{1}{2}$ " to  $2\frac{1}{2}$ " pipe and armored cable. Patented radiating ridges and 5-point gripping surface keep pipe and cables suspended dead center, permitting it to be carried securely at any angle to the beam. Write today for Catalog 38-A.



MANUFACTURERS OF EFFICIENCY  
ELECTRICAL DEVICES FOR CONDUIT,  
WIRE AND CABLE SUSPENSION

**Efficiency**  
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EAST PALESTINE, OHIO  
**"EFFICIENCY" DEVICES FOR CONDUIT and CABLE SUSPENSION**



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Use QUIK-LABEL Wire Markers for fast, positive identification of wires, cables, coils, circuits, harnesses...and thousands of other uses. Simplify installation and maintenance, prevent costly errors, save time and money.

Brady QUIK LABELS stick without moistening. They come on handy, pocket sized cards for use right on the job. Over 1000 different markers in stock for immediate shipment...including all standard NEMA colors. Colored markers eliminate the burden of stocking colored wire. Special markers made to your requirements.

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W.H. BRADY COMPANY  
EAST 5TH & SPRING STREET - CHIPPEWA FALLS, WIS.



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THEY'RE SOLDERLESS V CORRUGATIONS CLAMP WIRES SECURELY  
... HAVE NO SEPARATE PARTS  
REQUIRE ONLY SCREWDRIVER,  
WRENCH OR PLIERS TO INSTALL!

PART NO.		B & S WIRE	
Plain	Rex Head	Max.	Min.
Screw	SC-12X	2-12 Solid	2-20
SC-6	SC-6X	2-6 Strand	2-12
SC-6X	SC-6X549	2-6 Strand	2-10
SC-6	SC-6X	2-4 Strand	2-8
SC-2	SC-2X	2-2 Strand	2-4



## INDUSTRY NEEDS QUALITY LIGHTING . . . PART II

[FROM PAGE 81]

in which they work will do more. Improving the lighting is one way in which workers have been made to want to work in plant—particularly where new workers are involved. In some instances, relighting has actually made the night shift more attractive to workers than the day shift.

Regardless of the quality of illumination provided, there is one element of extreme importance in completing any seeing task and that is "time". We know that there is a "time" of seeing, and an increasing speed of seeing with better lighting. Seconds saved with better illumination add up to minutes and hours. As long as human beings remain the most important production factor, speed of seeing, safety, maximum production and adequate quality footcandle values will travel hand in hand.

To be specific let us take a typical "time" example. An average cost of installing a modern high-comfort 50-footcandle fluorescent industrial lighting system would be about \$1.00 per square foot. Figuring an average of 100 square feet per workman, it would cost \$100.00 for the new lighting installation. Amortizing cost per year would be about \$18.00. To get 50 footcandles would require six 40-watt fluorescent lamps per 100 square feet. During an emergency such as we are now experiencing, factories operate double shifts or more. On a 4000-hour year (double shift) basis, and a 30% lamp discount (including excise tax), the annual lamp renewal cost would be about \$5.00 for the 100 square feet. The yearly current cost at 11 $\frac{1}{2}$  per kWh, would be about \$18.00. The total yearly lighting cost per 100 square feet would add up to \$41.00. A conservative wage rate would be \$1.50 per hour or a total of \$6,000.00 per year. If workmen under the better lighting can speed production as little as 7/10ths of 1%, they pay for the entire lighting cost. In an 8-hour day that represents about three minutes of the workman's time. This is less time than it ordinarily takes to get a drink of water.

Ridiculous? Yes, it is! Yet, tests over the years show production increases far in excess of 1%. Amazing as it may seem, very small increases in production pays for both operating and amortization costs of a good lighting system. Indeed, it pays for the installed cost of the lighting system in a surprisingly short time.

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Two charts showing "Comparative Lighting Costs" for various types of industrial lighting fixtures and light sources were included in Part I of this article. Two additional charts, Chart IV and Chart V, are included in this Part II.

Chart IV analyzes six top-quality lighting systems for comfort of seeing. Except for the 2-40 watt commercial type unit, the fixtures are of the industrial type using porcelain enameled reflectors. The commercial type unit is one which is of all-metal construction finished in baked white enamel. While this fixture is of rugged design it must be remembered that the baked white enamel finish is not as durable as the porcelain enamel finish. Since atmospheric conditions in factories are usually quite dusty, oily, contain fine metallic particles, etc., baked enamel surfaces could not be cleaned too often lest the finish be damaged. This is not true of porcelain with its hard glass-like surface. However, there are production areas where rooms are quite clean and even air conditioned where the commercial unit would apply and do an excellent lighting job. Inasmuch as some 50% of the light is directed upward, ceiling conditions should be ideal preferably flat and of concrete or plaster painted white, or acoustical blocks.

Many production areas have seeing tasks as difficult as, and often more severe, than office areas. Why not provide these production areas with lighting equal to that for offices? Such production areas have either a high investment cost in machinery, or in employees, or both. Consequently the cost of a good lighting system would be insignificant compared to the machinery and labor costs. So why not install in areas where it is suitable troffer (recessed) fixtures for greater comfort of seeing? Chart V shows five types of troffers applicable for production lighting. The prismatic unit with a new controlens is a wonderful new lighting tool. Here brightness is properly controlled in the "glare zone", and comfortable lighting is assured.

While Alzak aluminum troffers top the list, as far as costs are concerned, of all fixtures analyzed in this article, they nevertheless have many worthwhile applications where top quality lighting is necessary.

There is a place for every fixture, and a fixture for every place in industry. The proper selection of a fixture, regardless of cost, will produce the most satisfactory results from the standpoint of human productivity and plant efficiency.

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**NEW LIGHT SOURCE**

[FROM PAGE 83]

and availability has a wide range of applications and uses waiting to be developed. These are for applications and areas in which a low brightness source is suitable. These include:

Dial Lighting—for clocks, radios, instruments, and meters.

Safety Markers—for switch plates, night lights, stair risers, guard rails.

Indicators—exit signs, elevator panels, etc.

Luminous Panels—for windows, walls, columns, around television screens, and other structural elements.

Luminous Ornaments—religious crosses, decorative objects, signs.

Industry itself will find many ways to make use of this "two-dimensional, area" light source, for utilitarian and for decorative purposes. It will be adapted to industrial uses, and to products of many kinds—furniture, cabinets, shelves, table tops; meters and instruments, and clocks; decorative lighting effects in the home, in restaurants, theatres, reception rooms; and in many other applications where a cool light source, of uniform low brightness, in colors or white, is desirable. Sylvania will also promote new markets and new applications of all types for this lamp, timed and geared to production facilities and improvements as they become available.

Panel-escalent will eventually be used to provide light for normal seeing purposes. This will occur only after its basic brightness has been adequately increased, and the color quality of the "white" light is satisfactory for this use. In its present form it may be used as a luminous ceiling, or for luminous wall areas, to cover columns, and in a wide range of architectural and decorative applications, but only for its decorative effect and in areas of general low brightness on the order of three to eight footcandles. As it is improved in efficiency its field of application will increase, especially in the field of providing light for seeing. It provides the architect, the designer, and the lighting engineer, for the first time, with a long needed "area" light source, to complete the geometric needs of points, lines, and planes of light to provide the most flexible solution of lighting problems in architecture, in mechanical devices, and in manufactured products. Panel-escalent may rapidly take its place as a major light source. Its announcement truly marks a milestone in electric lighting history and progress.

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## WIRING A HIGHWAY FOR TOMORROW

[FROM PAGE 69]

sand, and then withdrawing the tubes. As embankments increased in height and weight these sand drains absorbed water from the subsoil, and the water was forced to the surface where it was drawn away from the right-of-way. Nearly 5 million linear feet of such drains were installed to speed the settling of the roadbed. Settling was also speeded by placing earth overloads on the fill during construction, then removing this superimposed load when the settling was complete. Marshland and meadow silt was particularly obnoxious at bridge sites, for steel piling occasionally had to go down 200 feet for support.

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(FROM PAGE 86)

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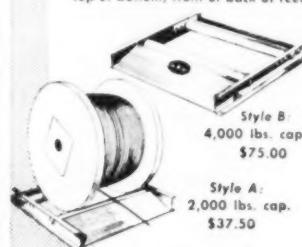
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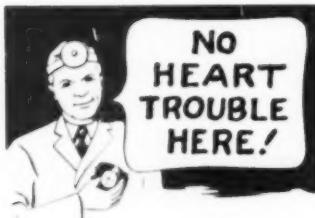
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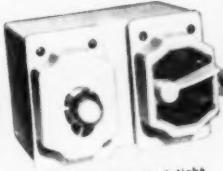
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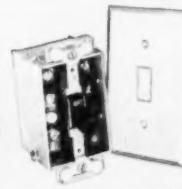
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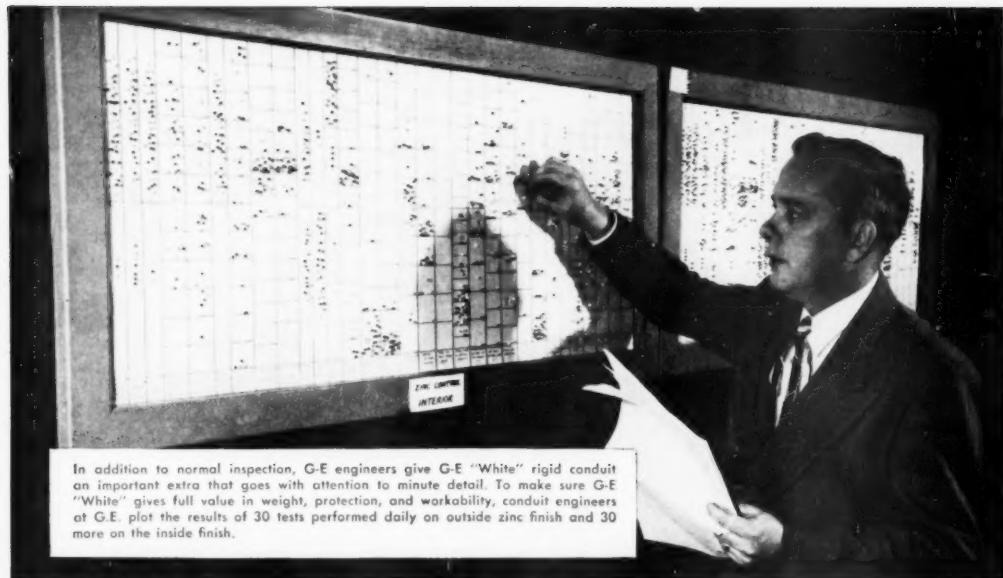
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